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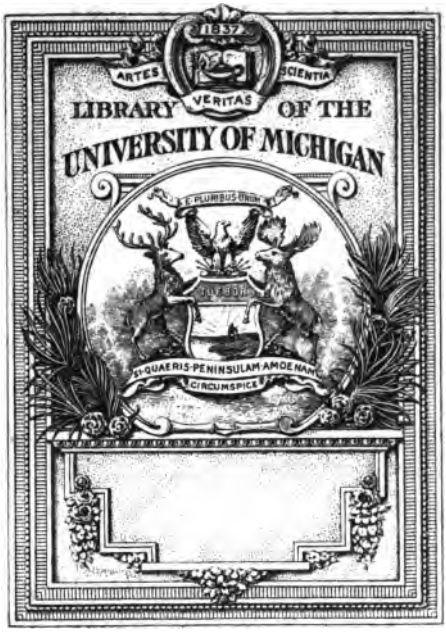
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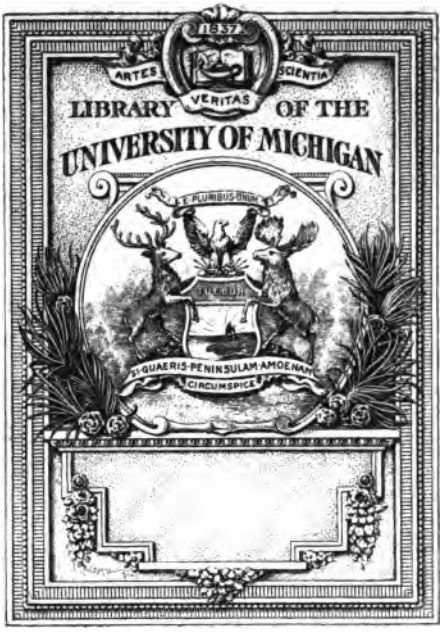
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MEDICO-CHIRURGICAL TRANSACTIONS.

75931

PUBLISHED BY

THE ROYAL

MEDICAL AND CHIRURGICAL SOCIETY

OF

LONDON.

VOLUME THE FIFTY-SECOND.

LONDON:
LONGMANS, GREEN, READER, AND DYER,
PATERNOSTER ROW.

1869.

PRINTED BY J. E. ADLARD, BARTHOLOMEW CLOSE.

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FOR THE SESSION OF 1869-70.

BALLARD, EDWARD, M.D.
BARNES, ROBERT, M.D.
BARWELL, RICHARD.
BASHAM, WILLIAM RICHARD, M.D.
BIRKETT, JOHN.
CALLENDER, GEORGE WILLIAM.
CLARK, FREDERICK LE GROS.
COCK, EDWARD.
CRITCHETT, GEORGE.
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1805. WILLIAM SAUNDERS, M.D.
1808. MATTHEW BAILLIE, M.D.
1810. SIR HENRY HALFORD, Bart., M.D., G.C.H.
1813. SIR GILBERT BLANE, Bart., M.D.
1815. HENRY CLINE.
1817. WILLIAM BABINGTON, M.D.
1819. SIR ASTLEY PASTON COOPER, Bart., K.C.H., D.C.L.
1821. JOHN COOKE, M.D.
1823. JOHN ABERNETHY.
1825. GEORGE BIRKBECK, M.D.
1827. BENJAMIN TRAVERS.
1829. PETER MARK ROGET, M.D.
1831. WILLIAM LAWRENCE.
1833. JOHN ELLIOTSON, M.D.
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1837. RICHARD BRIGHT, M.D., D.C.L.
1839. SIR BENJAMIN COLLINS BRODIE, Bart., D.C.L.
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1847. JAMES MONCRIEFF ARNOTT.
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1851. JOSEPH HODGSON.
1853. JAMES COPLAND, M.D.
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1857. SIR CHARLES LOCOCK, Bart., M.D.
1859. FREDERIC CARPENTER SKEY.
1861. BENJAMIN GUY BABINGTON, M.D.
1863. RICHARD PARTRIDGE.
1865. JAMES ALDERSON, M.D.
1867. SAMUEL SOLLY.
1869. GEORGE BURROWS, M.D.

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P.—President.	V.P.—Vice-President.
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L.—Librarian.	C.—Member of Council.

The figures succeeding the words *Trans.* and *Pro.* show the number of Papers which have been contributed to the Transactions or Proceedings by the Fellow to whose name they are annexed. *Sci. Com.* is attached to the names of those who have served on the Scientific Committees of the Society.

OCTOBER, 1869.

Those marked thus (†) have paid the Composition Fee in lieu of further annual subscriptions.

Amongst the non-residents, those marked thus (*) are entitled by composition to receive the Transactions.

Elected

1841 *ABERCROMBIE, JAMES, M.D., Cape of Good Hope.

1869 ABERCROMBIE, JAMES, jun., M.D., Cape Town, Cape of Good Hope.

1846 *ABERCROMBIE, JOHN, M.D., Physician to the Cheltenham General Hospital, 13, Suffolk square, Cheltenham.

1851 *ACLAND, HENRY WENTWORTH, M.D., F.R.S., Honorary Physician to H.R.H. the Prince of Wales; Physician to the Radcliffe Infirmary; Regius Professor of Medicine, and Clinical Professor in the University of Oxford.

1847 ACOSTA, ELISHA, M.D., 24, Rue du Luxembourg, St. Honoré, Paris.

Elected

1842 ACTON, WILLIAM, 17, Queen Anne street, Cavendish square. *Trans.* 1.

1851 ADAMS, JOHN, Consulting Surgeon to the London Hospital; 10, Finsbury circus. *Trans.* 3.

1852 ADAMS, WILLIAM, Surgeon to the Royal Orthopædic Hospital; 5, Henrietta street, Cavendish square. *Trans.* 2.

1867 AIKIN, CHARLES ARTHUR, 7, Clifton place, Hyde park.

1837 *AINSWORTH, RALPH FAWSETT, M.D., Consulting Physician to the Manchester Royal Infirmary; Cliff Point, Lower Broughton, Manchester.

1839 ALCOCK, SIR RUTHERFORD, K.C.B., K.C.T., K.T.S., D.C.L., H.M.'s Envoy Extraordinary at the Court of Pekin. *Trans.* 1.

1826 ALDERSON, JAMES, M.D., F.R.S. President of the Royal College of Physicians; 17, Berkeley square. S. 1829. C. 1848. T. 1849. V.P. 1852-3. P. 1865-6. *Trans.* 3.

1843 ALDIS, CHARLES JAMES BERRIDGE, M.D., Medical Officer of Health for St. George's, Hanover square; Senior Physician to the Surrey Dispensary; and Physician to the St. Paul and St. Barnabas Dispensary; 45B, Chester square. *Trans.* 2.

1850 ALEXANDER, CHARLES REVANS, Surgeon to the Royal Infirmary for Diseases of the Eye; 6, Cork street, Bond street.

1866 ALLBUTT, THOMAS CLIFFORD, M.A. and M.D., F.L.S., Lecturer on the Practice of Physic at the Leeds School of Medicine, and Physician to the Leeds General Infirmary; 88, Park square, Leeds. *Trans.* 3.

1869 ALLEN, PETER, M.D., Aural Surgeon to St. Mary's Hospital; 15, Savile row.

1863 ALTHAUS, JULIUS, M.D., 18, Bryanston street, Portman square. *Trans.* 1.

1862 ANDREW, EDWYN, M.D., Windsor House, Shrewsbury.

1862 ANDREW, JAMES, M.D., Physician to, and Lecturer on Medicine at, St. Bartholomew's Hospital; 59, Russell square.

Elected

1820 ANDREWS, THOMAS, M.D., Norfolk, Virginia.

1867 ANSTIE, FRANCIS EDMUND, M.D., Senior Assistant-Physician and Lecturer on Materia Medica at the Westminster Hospital; 16, Wimpole street, Cavendish square.

1869 ARCHER, EDMUND, M.D., Physician to the West Norfolk Hospital, King's Lynn. [*Deceased.*]

1819 †ARNOTT, JAMES MONCRIEFF, F.R.S., Chapel House, Lady Bank, Fifeshire. L. 1826-8. V.P. 1832-3. T. 1835-40. C. 1846, 1855-6. P. 1847-8. *Trans.* 8.

1817 †ASHBURNER, JOHN, M.D., F.L.S., 1, Hyde park place, Cumberland gate. C. 1821, 1830-31.

1851 ASHTON, THOMAS JOHN, Consulting Surgeon to the St. Marylebone Infirmary; 31, Cavendish square.

1820 *BADLEY, JOHN, Dudley, Worcestershire.

1836 BAIRD, ANDREW WOOD, M.D., Physician to the Dover Hospital; 7, Camden crescent, Dover, Kent.

1851 *BAKER, ALFRED, Surgeon to the Birmingham General Hospital, and Lecturer on Surgery at Sydenham College; 20A, Temple row, Birmingham.

1865 BAKER, WILLIAM MORRANT, Lecturer on Anatomy and Physiology, and Warden of the College, St. Bartholomew's Hospital. *Trans.* 2.

1869 BAKEWELL, ROBERT HALL, M.D., President of the Medical Board of Trinidad; Trinidad.

1839 †BALFOUR, THOMAS GRAHAM, M.D., F.R.S., Deputy Inspector-General of Hospitals; 6, Whitehall yard. C. 1852-3. V.P. 1860-1. *Trans.* 2.

1848 BALLARD, EDWARD, M.D., Medical Officer of Health for Islington; 7, Compton terrace, Upper street, Islington. *Trans.* 5.

1849 BALLARD, THOMAS, M.D., 10, Southwick place, Hyde park square.

1866 *BANKS, JOHN THOMAS, M.D., Physician to Richmond, Whitworth, and Hardwicke Hospitals, and Sir Patrick Dun's Hospital; Consulting Physician to the Coombe Hospital; 10, Merrion square east, Dublin.

Elected

1847 BARCLAY, ANDREW WHYTE, M.D., Physician to, and Lecturer on Medicine at, St. George's Hospital; Medical Officer of Health for Chelsea; 23A, Bruton street, Berkeley square. S. 1857-60. L. 1861-2. C. 1865-6. *Trans.* 2.

1862 BARKER, EDGAR, jun., 6, Upper Hyde park street.

1833 †BARKER, THOMAS ALFRED, M.D., Consulting Physician to, and Lecturer on Medicine at, St. Thomas's Hospital; 27, Wimpole Street. C. 1844-5. V.P. 1853-4. T. 1860-2. *Trans.* 6.

1861 BARNES, ROBERT, M.D., Obstetric Physician to, and Lecturer on Midwifery at, St. Thomas's Hospital; 31, Grosvenor street. *Trans.* 4.

1864 BARRATT, JOSEPH GILLMAN, M.D.; 8, Cleveland gardens, Bayswater.

1840 BARROW, BENJAMIN, Surgeon to the Royal Isle of Wight Infirmary; Southlands, Ryde, Isle of Wight.

1859 BARWELL, RICHARD, Surgeon to, and Lecturer on Anatomy at, the Charing Cross Hospital; 32, George street, Hanover square. *Trans.* 1.

1844 BASHAM, WILLIAM RICHARD, M.D., Senior Physician to, and Lecturer on Medicine at, the Westminster Hospital; 17, Chester street, Belgrave square. S. 1852-4. C. 1860-1. V.P. 1864-5. *Trans.* 2.

1868 BASTIAN, HENRY CHARLTON, M.A., M.D., F.R.S., Professor of Pathological Anatomy in University College, London, and Assistant-Physician to University College Hospital; 20, Queen Anne street. *Trans.* 1.

1862 BEALE, LIONEL SMITH, M.B., F.R.S., Professor of Pathological Anatomy in King's College, London, and Physician to King's College Hospital; 61, Grosvenor street. *Trans.* 1.

1860 BEALEY, ADAM, M.D., M.A. Camb., Birch Lea, Harrogate.

1841 BEAMAN, GEORGE, M.D., 3, Henrietta street, Covent garden.

1856 BEARDSLEY, AMOS, F.L.S., Bay villa, Grange, Newton in Cartmel, Lancashire.

Elected

1865 BEATTIE, HENRY, M.D., 5, Albert square, Commercial road east.

1836 BEAUMONT, WILLIAM RAWLINGS, Consulting Surgeon to the Toronto General Hospital, late Professor of Surgery in the University of King's College; Toronto, Canada West. *Trans.* 3.

1840 BEEVOR, CHARLES, 129, Harley street, Cavendish square.

1858 BEGLEY, WILLIAM CHAPMAN, M.D., Middlesex County Lunatic Asylum, Hanwell.

1819 †BELL, THOMAS, F.R.S., F.L.S., The Wakes, Selborne, Hants. C. 1832-3. V.P. 1854. *Trans.* 1.

1847 BENNET, JAMES HENRY, M.D., The Ferns, Weybridge, and Mentone.

1845 BERRY, EDWARD UNWIN, 76, Gower street, Bedford square.

1820 BERTIN, STEPHEN, Paris.

1865 *BICKERSTETH, EDWARD ROBERT, Surgeon to the Royal Infirmary, Liverpool, and Lecturer on Clinical Surgery in the Liverpool School of Medicine; 2, Rodney street, Liverpool.

1815 †BILLING, ARCHIBALD, M.D., F.R.S., Member of the Senate of the University of London; 6, Grosvenor gate. C. 1825. V.P. 1828-9.

1854 BIRD, PETER HINCKES, F.L.S., 1, Norfolk square, Hyde park.

1856 BIRD, WILLIAM, Surgeon to the West London Hospital; Bute House, Hammersmith.

1849 BIRKETT, EDMUND LLOYD, M.D., Physician to the City of London Hospital for Diseases of the Chest; 48, Russell square. C. 1865-6

1851 BIRKETT, JOHN, F.L.S., Surgeon to, and Lecturer on Surgery at, Guy's Hospital; Professor of Pathology and Surgery to the Royal College of Surgeons; 59, Green street, Grosvenor square. L. 1856-7. S. 1863-5. C. 1867-8. *Trans.* 8. *Sci. Com.*

1866 BISHOP, EDWARD, M.D., Cintra park, Upper Norwood.

Elected

1843 BLACK, PATRICK, M.D., *Treasurer*, Physician to, and Lecturer on Medicine at, St. Bartholomew's Hospital; 11, Queen Anne street, Cavendish square. C. 1856. V.P. 1866. T. 1869.

1847 BLACKMAN, GEORGE C., M.D., Professor of Surgery in the Medical College of Ohio; New York, U.S.

1840 BLAKISTON, PEYTON, M.D., F.R.S., St. Leonard's-on-Sea.

1865 BLANCHET, HILARION, Examiner to the College of Physicians and Surgeons, Lower Canada; 6, Palace street, Quebec, Canada East.

1865 BLANDFORD, GEORGE FIELDING, M.D., Lecturer on Psychological Medicine at St. George's Hospital; 3, Clarges street, Piccadilly.

1867 BLOXAM, JOHN ASTLEY, Royal Horse Guards (Blue), Cavalry Barracks, Windsor.

1823 BOJANUS, LOUIS HENRY, M.D., Wilna.

1846 BOSTOCK, JOHN ASHTON, Hon. Surgeon to H.M. the Queen; Surgeon-Major Scots Fusilier Guards; 54, Chester square, Belgravia. C. 1861-2. *Sci. Com.*

1869 BOURNE, WALTER, M.D., Thames chambers, 12, York buildings, Adelphi.

1841 BOWMAN, WILLIAM, F.R.S., F.L.S., Surgeon to the Royal London Ophthalmic Hospital, Moorfields; 5, Clifford street, Bond street. C. 1852-3. V.P. 1862. *Trans.* 3.

1862 BRACE, WILLIAM HENRY, M.D., 1, Gay street, Bath.

1867 *BRETT, ALFRED T., M.D., Lime-tree House, Watford, Herts.

1867 BRIDGWATER, THOMAS, M.B. Lond., Harrow-on-the-Hill, Middlesex.

1868 BROADBENT, WILLIAM HENRY, M.D., Assistant-Physician to, and Lecturer on Physiology at, St. Mary's Hospital; Physician to the London Fever Hospital; 44, Seymour street, Portman square.

1851 BRODHURST, BERNARD EDWARD, F.L.S., Orthopædic Surgeon to St. George's Hospital, and Assistant-Surgeon to the Royal Orthopædic Hospital; 20, Grosvenor street. C. 1868-9. *Trans.* 2. *Pro.* 1.

Elected

1844 †Brooke, Charles, M.A., F.R.S., *Librarian*, Consulting Surgeon to the Westminster Hospital; 16, Fitzroy square. C. 1855. L. 1866-69.

1857 *Brown, Robert, Surgeon to the Cumberland Dispensary; 5, Devonshire street, Carlisle.

1860 Brown-Sequard, Charles Edouard, M.D., F.R.S., Professor of Physiology and Pathology, Massachusetts Medical College, Harvard University, Boston, U.S.; Professor of Comparative Pathology to the Faculty of Medicine, Paris; Paris. *Sci. Com.*

1851 Browne, Alexander, M.D., Twynholm, Kirkcudbright.

1867 Brunjes, Martin, 42, Brook street, Grosvenor square.

1860 Bryant, Thomas, Assistant-Surgeon to, and Demonstrator of Operative Surgery at, Guy's Hospital; 2, Finsbury Square. *Trans.* 7; *Pro.* 1. *Sci. Com.*

1855 Bryant, Walter John, L.R.C.P. Edinb.; 23a, Sussex square, Hyde park gardens.

1823 Buchanan, B. Bartlet, M.D.

1864 Buchanan, George, M.D., Medical Inspector for the Privy Council; 24, Nottingham place.

1864 Buckle, Fleetwood, M.D., H.M.S. 'Orontes,' Portsmouth.

1839 Budd, George, M.D., F.R.S., Consulting Physician to the Seamen's Hospital Ship 'Dreadnought;' Needham, Suffolk. C. 1846-7. V.P. 1857. *Trans.* 5.

1833 †Burrows, George, M.D., F.R.S., *President*, Consulting Physician to St. Bartholomew's Hospital; Physician to Christ's Hospital; Member of the Senate of the University of London; 18, Cavendish square. C. 1839-40, 1858-9. T. 1845-7. V.P. 1849-50. P. 1869. *Trans.* 2.

1837 †Busk, George, F.R.S., F.L.S., Consulting Surgeon to the Seamen's Hospital Ship 'Dreadnought;' 32, Harley street, Cavendish square. C. 1847-8. V.P. 1855. T. 1866. *Trans.* 4.

1818 Butter, John, M.D., F.R.S., F.L.S., Physician Extraordinary to the Plymouth Royal Eye Infirmary; Windsor villa, Plymouth.

Elected

1868 BUZZARD, THOMAS, M.D., Physician to the National Hospital for the Epileptic and Paralysed; 56, Grosvenor street, Grosvenor square.

1851 *CADGE, WILLIAM, Surgeon to the Norfolk and Norwich Hospital; 24, St. Giles's street, Norwich. *Trans.* 1.

1861 CALLENDER, GEORGE WILLIAM, Assistant-Surgeon to, and Lecturer on Anatomy at, St. Bartholomew's Hospital; 47, Queen Anne street, Cavendish square. *Trans.* 2. *Sci. Com.*

1852 *CANNEY, GEORGE, M.D., Bishop-Auckland, Darlington, Durham.

1847 CARLILL, JOHN BURFORD, M.D., Surgeon-Accoucheur to the Newman street Lying-in Institution; 42, Weymouth street, Portland place.

1853 CARTER, ROBERT BRUDENELL, 8, Prince's street, Hanover square.

1845 CARTWRIGHT, SAMUEL, Professor of Dental Surgery at King's College, London; Surgeon-Dentist to King's College Hospital; 32, Old Burlington street. C. 1860–1. *Sci. Com.*

1839 CATHROW, WILLIAM, Stoke lodge, Stoke, near Slough. C. 1860-1.

1868 CAVAFY, JOHN, M.B. Lond., Medical Registrar and Demonstrator of Morbid Anatomy at the Westminster Hospital; 5, Whitehall.

1845 CHALK, WILLIAM OLIVER, Surgeon to the St. Marylebone Eye and Ear Institution; 3, Nottingham terrace, York gate, Regent's park.

1844 CHAMBERS, THOMAS KING, M.D., *Librarian*, Hon. Physician to H.R.H. the Prince of Wales; Consulting Physician to, and Lecturer on Medicine at, St. Mary's Hospital; Consulting Physician to the Lock Hospital; 64, Brook street, Grosvenor square. C. 1861. V.P. 1867. L. 1869. *Trans.* 1.

1859 CHANCE, FRANK, M.D., Croft Lodge, Cambridge.

1849 CHAPMAN, FREDERICK, Old Friars, Richmond green, Surrey.

Elected

1837 †CHAPMAN, HENRY THOMAS, 21, Lower Seymour street, Portman square. C. 1858.

1868 CHEADLE, WALTER BUTLER, M.D., Assistant-Physician to St. Mary's Hospital; 2, Hyde park place, Cumberland gate.

1865 CHOLMELEY, WILLIAM, M.D., Physician to the Great Northern Hospital; 40, Russell square.

1842 CHOWNE, WILLIAM DINGLE, M.D., Consulting Physician to the Charing Cross Hospital; Corresponding Fellow of the Royal Academy of Surgery of Madrid; 17, Hyde park place, Cumberland gate. C. 1853-4.

1866 CHURCH, WILLIAM SELBY, M.D., Reader in Anatomy, Christ Church, Oxford; Assistant-Physician to, and Lecturer on Comparative Anatomy at, St Bartholomew's Hospital; 2, Upper George street, Bryanston square.

1860 CLARK, ANDREW, M.D., Physician to, and Lecturer on Medicine at, the London Hospital; 16, Cavendish square.

1839 †CLARK, FREDERICK LE GROS, Surgeon to, and Lecturer on Surgery at, St. Thomas's Hospital; Surgeon to the Magdalen Hospital, and Consulting Surgeon to the Royal Surrey County Hospital; Examiner in Surgery to the University of London; 14, St. Thomas's street, Southwark, and Lee, Kent. S. 1847-9. V.P. 1855-6. *Trans.* 3.

1848 CLARKE, JOHN, M.D., Obstetric Physician to, and Lecturer on Midwifery at, St. George's Hospital; Physician to the General Lying-in Hospital; 42, Hertford street, May fair. C. 1866.

1866 CLARKE, WILLIAM FAIRLIE, Surgeon to the West London Hospital; 1, Curzon street, May fair.

1861 *CLARKE, WILLIAM JAMES, Surgeon to the Huddersfield Infirmary; John-William street, Huddersfield, Yorkshire.

1850 CLARKSON, JOSIAH, New Hall street, Birmingham. *Trans.* 1.

Elected

1842 CLAYTON, OSCAR MOORE PASSEY, Extra Surgeon-in-Ordinary to H.R.H. the Prince of Wales, and Surgeon-in-Ordinary to H.R.H. the Duke of Edinburgh; 5, Harley street. C. 1865.

1853 CLOVER, JOSEPH THOMAS, 3, Cavendish place, Cavendish square.

1857 COATES, CHARLES, F.R.C.P. Edinb., Physician to the Bath United General Hospital; 10, Circus, Bath.

1851 COCK, EDWARD, Senior Surgeon to, and Lecturer on Clinical Surgery at, Guy's Hospital; Consulting Surgeon to the Asylum for Deaf and Dumb; Dean street south, Tooley street, Southwark. C. 1857. *Trans.* 3.

1868 COCKLE, JOHN, M.D., F.L.S., Physician to the Royal Free Hospital; 13, Brook street, Hanover square. *Trans.* 2.

1850 COHEN, DANIEL WHITAKER, M.D., South Bank, North Down lane, Bideford, Devon.

1818 COLE, ROBERT, F.L.S., Holybourne, Hampshire.

1854 COLLINS, FREDERICK, M.D., Medical Officer of Health for Wanstead; Wanstead lodge, Essex.

1867 COOKE, T. C. WEEDEN, Senior Surgeon to the Royal Free Hospital, and to the Cancer Hospital; 76, Upper Berkeley street, Portman square.

1840 *COOKE, WILLIAM ROBERT, 2, Carlton villas, Hencroft street, Slough.

1865 COOPER, ALFRED, Assistant-Surgeon to St. Mark's Hospital; Junior Surgeon to the West London Hospital; 70, Jermyn street, Piccadilly.

1819 COOPER, GEORGE, Brentford, Middlesex.

1841 COOPER, GEORGE LEWIS, one of the Surgeons to the National Vaccine Institution, and Teacher of Vaccination to the Medical School of University College; Surgeon to the Bloomsbury Dispensary; 7, Woburn place, Russell square. C. 1860-1. *Trans.* 1.

1843 COOPER, WILLIAM WHITE, Surgeon-Oculist in Ordinary to H.M. the Queen; Consulting Ophthalmic Surgeon to St. Mary's Hospital; 19, Berkeley square. C. 1858-9.

Elected

1841 COOTE, HOLMES, Surgeon to, and Lecturer on Surgery at, St. Bartholomew's Hospital; 52, Margaret street Regent street. S. 1853-4. C. 1864-5. *Trans.* 2.

1835 COPELAND, GEORGE FORD, Cheltenham.

1822 †COPLAND, JAMES, M.D., F.R.S., Consulting Physician to the Royal Infirmary for Children, and to the Great Northern Hospital; Hon. Fellow of the Royal Academy of Sciences of Sweden, &c.; Hertford house, Brondesbury road, Kilburn. C. 1831. V.P. 1838-9. P. 1853-4.

1868 CORNISH, WILLIAM ROBERT, Surgeon, Madras Army; Secretary to the Inspector-General, Indian Medical Department.

1860 *CORRY, THOMAS CHARLES STEUART, M.D., Surgeon to the Belfast General Dispensary; 9, Clarendon place, Belfast.

1839 *CORSELLIS, CHARLES CÆSAR, M.D., F.L.S., Benson, Oxon.

1853 CORY, WILLIAM GILLETT, M.D.

1847 COTTON, RICHARD PAYNE, M.D., Physician to the Hospital for Consumption and Diseases of the Chest; 46, Clarges street, Piccadilly. C. 1863.

1828 †COULSON, WILLIAM, F.L.S., Consulting Surgeon to St. Mary's Hospital, and to the German Hospital; 2, Frederick's place, Old Jewry, and 1, Chester terrace, Regent's park. C. 1831. L. 1832-7. V.P. 1851-2. *Trans.* 1.

1864 COULSON, WALTER JOHN, Surgeon to the Lock Hospital, 29, St. James's place.

1860 †COUPER, JOHN, Surgeon to the London Hospital; Assistant-Surgeon to the Royal London Ophthalmic Hospital; 28, Park street, Grosvenor square.

1862 COWELL, GEORGE, Assistant-Surgeon to the Westminster Hospital; Surgeon to the Victoria Hospital for Children; 63, Belgrave road, Pimlico.

1841 CRAWFORD, MERVYN ARCHDALL NOTT, M.D., Wiesbaden. C. 1853-4.

1868 CRAWFORD, THOMAS, M.D., 6, Whitehall yard.

1869 *CRESSWELL, PEARSON R., Dowlais, Merthyr Tydvil.

Elected

1847 CRITCHETT, GEORGE, Surgeon to the Royal London Ophthalmic Hospital, Moorfields; 21, Harley street, Cavendish square. C. 1865. *Trans.* 1.

1868 CROFT, JOHN, Assistant-Surgeon to St. Thomas's Hospital; the Hospital, Newington.

1862 CROMPTON, SAMUEL, 17A, Princess street, Manchester.

1837 CROOKES, JOHN FARRAR, 5, Waterloo crescent, Dover.

1860 CROSS, RICHARD, M.D., 5, Queen street, Scarborough.

1849 *CROWFOOT, WILLIAM EDWARD, Beccles, Suffolk.

1851 CUMMING, JAMES CAMERON, M.D., 1, Cadogan place, Sloane street.

1865 CURGENVEN, J. BRENDON, 11, Craven hill gardens, Bayswater.

1846 CURLING, HENRY, Surgeon to the Margate Royal Sea-Bathing Infirmary, and the Ramsgate Seamen's Infirmary; Ramsgate, Kent.

1837 †CURLING, THOMAS BLIZARD, F.R.S., Consulting-Surgeon to the London Hospital; 39, Grosvenor-street. S. 1845-6. C. 1850. T. 1854-7. V.P. 1859. *Trans.* 13. *Pro.* 1. *Sci. Com.*

1847 CURREY, JOHN EDMUND, M.D., Lismore, County Waterford.

1822 CUSACK, CHRISTOPHER JOHN, Chateau d'Eu, France.

1852 CUTLER, THOMAS, M.D., Acting Physician at the Spa Waters; Spa, Belgium.

1836 *DANIEL, JAMES STOCK, Ramsgate, Kent.

1848 DAUBENY, HENRY, San Remo, Italy.

1846 DAVIES, FREDERICK, M.D., 124, Gower street, Bedford square.

1847 DAVIES, JOHN, M.D., Physician-Extraordinary to the Hertford General Infirmary, and Visiting Physician to the Hadham Palace Lunatic Asylum, Hertford.

1853 DAVIES, ROBERT COKER NASH, Rye, Sussex.

1852 DAVIES, WILLIAM, M.D., 10, Gay street, Bath.

1852 DAVIS, JOHN HALL, M.D., Physician Accoucheur to, and Lecturer on Midwifery at, the Middlesex Hospital; Physician to the Royal Maternity Charity, and Consulting Physician-Accoucheur to the St. Pancras Infirmary; 24, Harley-street, Cavendish-square. C. 1869.

Elected

1818 DAWSON, JAMES, Wray Castle, Windermere.

1847 DAY, GEORGE EDWARD, M.D., F.R.S., Emeritus Professor of Medicine in the University of St. Andrews; Furzewell House, Torquay.

1867 DAY, WILLIAM HENRY, M.D., Physician to the Margaret street Dispensary for Consumption; 10, Manchester square.

1867 DE MERIC, VICTOR, Surgeon to the Royal Free Hospital, and to the German Hospital, Dalston; 52, Brook street, Grosvenor square.

1846 *DENTON, SAMUEL BEST, M.D., Ivy Lodge, Hornsea, Hull.

1859 DICKINSON, WILLIAM HOWSHIP, M.D., Assistant-Physician to, and Lecturer on Materia Medica at, St. George's Hospital; Physician to the Hospital for Sick Children; 11, Chesterfield street, May fair. *Trans.* 9. *Sci. Com.*

1844 DICKSON, ROBERT, M.D., F.L.S. C. 1860.

1839 †DIXON, JAMES, Consulting Surgeon to the Royal London Ophthalmic Hospital, Moorfields; Consulting Ophthalmic Surgeon to the Asylum for Idiots; 2, Portman square. L. 1849-55. V.P. 1857-8. T. 1863-4. C. 1866-7. *Trans.* 4.

1862 DOBELL, HORACE B., M.D., Physician to the Royal Infirmary for Diseases of the Chest, City road; 84, Harley street. *Trans.* 1.

1845 DODD, JOHN.

1857 DOUGLAS, ARCHIBALD, M.D., 8, Clifton place, Sussex square, Hyde park.

1863 DOWN, JOHN LANGDON HAYDON, M.D., Physician to, and Lecturer on Materia Medica and Therapeutics at, the London Hospital; 39, Welbeck street, Cavendish square. *Trans.* 2.

1867 DRAGE, CHARLES, M.D., Hatfield, Herts.

1853 DRUITT, ROBERT, M.R.C.P., 37, Hertford street, May fair. *Trans.* 2.

1865 DRYSDALE, CHARLES ROBERT, M.D., Physician to the Farringdon Dispensary; Assistant-Physician to the Metropolitan Free Hospital; 99, Southampton row, Russell square.

Elected

1865 DUCKWORTH, DYCE, M.D., Assistant-Physician to St. Bartholomew's Hospital; 11, Grafton street, Bond street.

1845 DUFF, GEORGE, M.D., High Street, Elgin.

1845 DUFFIN, EDWARD WILLSON, 18, Devonshire street, Portland place. *Trans.* 1.

1867 DUKES, M. CHARLES, M.D., High House, Enfield Highway.

1833 †DUNN, ROBERT, 31, Norfolk street, Strand. C. 1845-6. *Trans.* 2.

1861 DU PASQUIER, CLAUDIUS FRANCIS, Surgeon-Apothecary to H.M. the Queen, and to the Household of H.R.H. the Prince of Wales; 62, Pall Mall.

1863 DURHAM, ARTHUR EDWARD, F.L.S., Assistant-Surgeon to, and Lecturer on Anatomy at, Guy's Hospital; 82, Brook street, Grosvenor square. *Trans.* 2. *Sci. Com.*

1843 DURRANT, CHRISTOPHER MERCER, M.D., Physician to the East Suffolk and Ipswich Hospital; Ipswich, Suffolk.

1839 DYER, HENRY SUMNER, M.D., Sennowe Hall, Guist, Norfolk. C. 1854-5.

1836 EARLE, JAMES WILLIAM, late of Norwich.

1868 EASTES, GEORGE, M.B. Lond., 5, Albion place, Hyde park sq.

1824 EDWARDS, GEORGE.

1823 EGERTON, CHARLES CHANDLER, Kendall Lodge, Epping.

1869 ELAM, CHARLES, M.D., 18, Harley street, Cavendish square.

1861 *ELLIOT, ROBERT, M.D., Physician to the Carlisle Dispensary; 35, Lowther street, Carlisle.

1848 ELLIS, GEORGE VINER, Examiner in Anatomy at the University of London; Professor of Anatomy in University College, London. C. 1863-4. *Trans.* 2.

1868 ELLIS, JAMES, M.D., 2, Langton villas, St. John's road, Blackheath, and Infirmary, St. Pancras Workhouse.

1854 *ELLISON, JAMES, M.D., Surgeon in Ordinary to the Royal Household, Windsor; 14, High street, Windsor.

1835 ENGLAND, WILLIAM, M.D., Ipswich, Suffolk.

1842 ERICHSEN, JOHN E., Professor of Clinical Surgery in University College, London, and Surgeon to University College Hospital; Examiner in Surgery at the University of London; 6, Cavendish place, Cavendish square. C. 1855-6. V.P. 1868. *Trans.* 2.

Elected

1836 EVANS, GEORGE FABIAN, M.D., late Physician to the General Hospital, Birmingham.

1815 *EVANS, GRIFFITH FRANCIS DORSETT, M.D.; Crescent, Shrewsbury. C. 1838.

1845 EVANS, WILLIAM JULIAN, M.D., Pinner, Middlesex.

1864 FAGGE, CHARLES HILTON, M.D., Assistant-Physician to Guy's Hospital; 11, St. Thomas's street, Southwark. *Trans.* 1.

1869 FAIRBANK, FREDERICK ROYSTON, M.D., Lynton, North Devon.

1858 FALCONER, RANDLE WILBRAHAM, M.D., Physician to the Bath United Hospital; 22, Bennett street, Bath.

1862 FARQUHARSON, ROBERT, M.D., Medical Officer, Rugby School; Horton crescent, Rugby, Warwickshire.

1844 FARRE, ARTHUR, M.D., F.R.S., Physician-Accoucheur to H.R.H. the Princess of Wales and H.R.H. the Princess Louis of Hesse; 12, Hertford street, May fair. C. 1857. V.P. 1864. *Sci. Com.*

1863 FENWICK, SAMUEL, M.D., Assistant-Physician to the London Hospital; 29, Harley street, Cavendish square. *Trans.* 3.

1841 FERGUSSON, SIR WILLIAM, Bart., F.R.S., Sergeant-Surgeon to H.M. the Queen; Professor of Surgery in King's College, London, and Surgeon to King's College Hospital; 16, George street, Hanover square. C. 1849-50. V.P. 1863-4. *Trans.* 4.

1852 *FIELD, ALFRED GEORGE, Surgeon to St. Mary's Hospital, Brighton; 28, Old Steine, Brighton.

1849 FINCHAM, GEORGE TUPMAN, M.D., Physician to, and Lecturer on Clinical Medicine at, the Westminster Hospital; 13, Belgrave road.

1866 FISH, JOHN CROCKETT, B.A., M.B. Camb., 92, Wimpole street, Cavendish square.

1836 †FISHER, SIR JOHN WILLIAM, 5, Grosvenor gate. C. 1843-4.

1860 FITZGERALD, THOMAS GEORGE, Staff-Surgeon; 6, Whitehall yard.

1866 FITZPATRICK, THOMAS, M.D., M.A., Dublin; 30, Sussex gardens, Hyde park.

Elected

1842 FLETCHER, THOMAS BELL ELCOCK, M.D., Physician to the Birmingham General Hospital; Waterloo street, Birmingham. *Trans.* 1.

1864 *FOLKER, WILLIAM HENRY, Surgeon to the North Staffordshire Infirmary; Hanley, Stoke-on-Trent, Staffordshire.

1848 FORBES, JOHN GREGORY, Surgeon to the Metropolitan Convalescent Institution; 82, Oxford terrace, Hyde park. C. 1868-9. *Trans.* 2.

1852 †FORSTER, JOHN COOPER, Assistant-Surgeon to, and Lecturer on Surgery at, Guy's Hospital; Surgeon to the Royal Infirmary for Children; 10, St. Thomas's street, Southwark. C. 1868-9. *Pro.* 1.

1865 FOSTER, BALTHAZAR WALTER, M.D., Professor of Medicine at the Queen's College, Birmingham, and Physician to the General Hospital; 4, Old square, Birmingham, and Grosvenor house, Edgbaston.

1859 FOX, EDWARD LONG, M.B., Physician to the Bristol Royal Infirmary; 1, Chesterfield place, Clifton.

1858 *FOX, WILSON, M.D., Physician-Extraordinary to H.M. the Queen; Professor of Clinical Medicine in University College, London, and Physician to University College Hospital; 22B, Cavendish square. *Trans.* 2.

1841 FRANZ, JOHN CHRISTOPHER AUGUSTUS, M.D.

1843 FRASER, PATRICK, M.D. C. 1866.

1868 FREEMAN, WILLIAM HENRY, 29, Spring gardens.

1836 †FRENCH, JOHN GEORGE, Surgeon to the St. James's Infirmary; 41, Great Marlborough street. C. 1852-3.

1849 FRERE, ROBERT TEMPLE, M.A., F.R.C.P., 143, Harley street.

1846 FULLER, HENRY WILLIAM, M.D., *Vice-President*, Physician to St. George's Hospital; 13, Manchester square. C. 1862. S. 1864-5. V.P. 1868-9. *Trans.* 3.

1864 *GAIRDNER, WILLIAM TENNANT, M.D., Professor of the Practice of Medicine in the University of Glasgow; Physician to the Glasgow Royal Infirmary; 21, Blythswood square, Glasgow.

1865 GANT, FREDERICK JAMES, Surgeon and Pathological Anatomist to the Royal Free Hospital; 16, Connaught square, Hyde park.

Elected

1867 GARLAND, EDWARD CHARLES, L.R.C.P. Edin., Yeovil, Somerset.

1867 GARLIKE, THOMAS W., Tulse Hill, Brixton.

1854 GARROD, ALFRED BARING, M.D., F.R.S., Professor of Materia Medica in King's College, London, and Physician to King's College Hospital; Examiner in Materia Medica at the University of London; 11, Harley street, Cavendish square. C. 1867. *Trans.* 8.

1857 GASCOYEN, GEORGE GREEN, *Secretary*, Surgeon to the Lock Hospital; Assistant-Surgeon to, and Lecturer on Anatomy at, St. Mary's Hospital; 48, Queen Anne street, Cavendish square. S. 1866-69. *Trans.* 3. *Sci. Com.*

1851 GASKOIN, GEORGE, 7, Westbourne park.

1819 GAULTER, HENRY.

1848 GAY, JOHN, Senior Surgeon to the Great Northern Hospital, and Consulting Surgeon to the Asylum for Idiots; 10, Finsbury place south.

1866 GEE, SAMUEL JONES, M.D., Assistant-Physician to St. Bartholomew's Hospital; Assistant-Physician to the Hospital for Sick Children; 54, Harley street, Cavendish square.

1821 *GEORGE, RICHARD FRANCIS, 20, Marlborough buildings, Bath.

1858 GODFREY, BENJAMIN, M.D., Carlton House, Enfield, Middlesex.

1867 GOODEVE, EDWARD, M.B., Hon. Physician to H.M. the Queen; late Surgeon-Major, H.M.'s Bengal army; 40, Park street, Grosvenor square.

1851 GOODFELLOW, STEPHEN JENNINGS, M.D., Physician to the Middlesex Hospital; 5, Savile row, Burlington gardens. C. 1864-5. *Trans.* 2.

1818 GORDON, JAMES ALEXANDER, M.D., F.R.S., Pixholme, near Dorking, Surrey. C. 1828. V.P. 1829. *Trans.* 1.

1862 GOULSTONE, JOHN G., M.D., 30, Clarence street, Liverpool.

1851 GOWLLAND, PETER YEAMES, Surgeon to St. Mark's Hospital; 34, Finsbury square.

1844 GRANTHAM, JOHN, Crayford, Kent.

Elected

1846 GREAM, GEORGE THOMPSON, M.D., Physician-Accoucheur to H.R.H. the Princess of Wales; 2, Upper Brook street, Grosvenor square. C. 1863.

1868 GREEN, THOMAS HENRY, M.D. Assistant-Physician to, and Lecturer on Pathology at, Charing Cross Hospital; 74, Wimpole street.

1843 GREENHALGH, ROBERT, M.D., Physician-Accoucheur to, and Lecturer on Midwifery at, St. Bartholomew's Hospital; Consulting Physician to the Samaritan Free Hospital for Women and Children, and to the City of London Lying-in Hospital; 72, Grosvenor street.

1860 GREENHOW, EDWARD HEADLAM, M.D., Examiner in Forensic Medicine at the University of London; Assistant-Physician to, and Lecturer on Public Health and on Medical Jurisprudence at, the Middlesex Hospital; and Consulting Physician to the Western General Dispensary; 77, Upper Berkeley street, Portman square. *Trans.* 2.

1868 GRIGG, WILLIAM CHAPMAN, 15, Cleveland Gardens, Bayswater.

1814 GROVE, JOHN, M.D., Salisbury.

1852 GROVE, JOHN, West Hill, Wandsworth, Surrey.

1860 GUENEAU DE MUSSY, HENRI, M.D., Physician to the French Hospital, Lisle street, Leicester square; 4, Cavendish place, Cavendish square.

1849 GULL, WILLIAM WITHEY, M.D., D.C.L., F.R.S., Member of the Senate of the University of London; 74, Brook street, Grosvenor square. C. 1864. *Trans.* 3.

1837 GULLY, JAMES MANBY, M.D., Great Malvern, Worcestershire.

1854 HABERSHON, SAMUEL OSBORNE, M.D., Physician to, and Lecturer on Materia Medica and Therapeutics at, Guy's Hospital; Examiner in Materia Medica at the University of London; 70, Brook street, Grosvenor square. S. 1867. C. 1869. *Trans.* 3.

1849 HAILEY, HAMMETT, F.L.S., Newport Pagnell, Bucks.

1848 HALLEY, ALEXANDER, M.D., F.G.S., 16, Harley street, Cavendish square.

Elected

1819 †HAMMERTON, THOMAS, Carlton Lawn, Cheltenham. C. 1829-30.

1838 †HANCOCK, HENRY, *Vice-President*, Surgeon to the Charing Cross Hospital; Surgeon to the Royal Westminster Ophthalmic Hospital; 76, Harley street, Cavendish square. C. 1851. V.P. 1869.

1848 *HARCOURT, GEORGE, M.D., Chertsey, Surrey.

1836 HARDING, JOHN FOSSE, Mount Sandford, Southborough, Tunbridge Wells. C. 1858-9.

1856 HARE, CHARLES JOHN, M.D., late Professor of Clinical Medicine in University College, London, and Physician to University College Hospital; 57, Brook street, Grosvenor square.

1857 HARLEY, GEORGE, M.D., F.R.S., Physician to University College Hospital; 25, Harley street, Cavendish square. *Trans.* 1. *Sci. Com.* 2.

1864 HARLEY, JOHN, M.D., F.L.S., Assistant-Physician to the London Fever Hospital; 78, Upper Berkeley street, Portman square. *Trans.* 3.

1866 HARPER, PHILIP H., 30, Cambridge street, Hyde park.

1859 HARRIS, FRANCIS, M.D., F.L.S., Physician to, and Lecturer on Botany at, St. Bartholomew's Hospital; Assistant-Physician to the Hospital for Sick Children; 24, Cavendish square.

1841 HARVEY, WILLIAM, Surgeon to the Royal Dispensary for Diseases of the Ear, and to the Freemasons' Female Charity; Aural Surgeon to the Great Northern Hospital; 2, Soho square. C. 1854.

1854 HAVILAND, ALFRED, late Surgeon to the Bridgewater Infirmary; 120, King Henry's road, Primrose hill.

1828 †HAWKINS, CÆSAR HENRY, F.R.S., Sergeant-Surgeon to H.M. the Queen, and Consulting Surgeon to St. George's Hospital; 26, Grosvenor street. C. 1830-1, 1860. V.P. 1838-9. T. 1841-4. P. 1855-6. *Trans.* 12.

1838 †HAWKINS, CHARLES, Inspector of Anatomical Schools in London; 27, Savile row, Burlington gardens. C. 1846-7. S. 1850. V.P. 1858. T. 1861-2. *Trans.* 2.

Elected

1848 HAWKSLEY, THOMAS, M.D., Physician to the Margaret street Dispensary for Consumption and Diseases of the Chest; 6, Brook street, Hanover square.

1860 HAYWARD, HENRY HOWARD, Assistant Surgeon-Dentist to St. Mary's Hospital; Dental Surgeon to the Hospital for Consumption, Brompton; 38, Harley street, Cavendish square.

1861 HAYWARD, WILLIAM HENRY, Church House, Oldbury, near Birmingham.

1848 *HEALE, JAMES NEWTON, M.D., Physician to the Winchester County Hospital; Winchester, Hants.

1865 HEATH, CHRISTOPHER, Assistant-Surgeon to University College Hospital; and Teacher of Operative Surgery in University College, London; 9, Cavendish place, Cavendish square.

1850 HEATON, GEORGE, M.D., Boston, U.S.

1829 †HEBERDEN, THOMAS, M.D., 98, Park street, Grosvenor square.

1844 HENNEN, JOHN, M.D. L. 1848-50.

1849 HENRIQUES, AMOS, M.D., Hon. Physician to the Spanish Embassy; 67, Upper Berkeley street, Portman square.

1821 HERBERSKI, VINCENT, M.D., Professor of Medicine in the University of Wilna.

1843 HEWETT, PRESCOTT GARDNER, Surgeon-Extraordinary to H.M. the Queen; Surgeon to St. George's Hospital; 1, Chesterfield street, May fair. C. 1859. V.P. 1866-7. *Trans.* 7. *Sci. Com.*

1855 HEWITT, GRAILY, M.D., Professor of Midwifery in University College, London, and Obstetric Physician to University College Hospital; 36, Berkeley square.

1853 HEWLETT, THOMAS, Surgeon to Harrow School; Harrow, Middlesex. *Trans.* 1.

1868 HILL, JOHN D., Surgeon to the Royal Free Hospital; 17, Guilford street, Russell square.

1862 HILL, MATTHEW BERKELEY, M.B. Lond., Assistant-Surgeon to University College Hospital; Surgeon to the Lock Hospital; 14, Weymouth street, Portland place.

Elected

1867 HILL, SAMUEL, M.D., 22, Mecklenburgh square.

1842 HILLMAN, WILLIAM AUGUSTUS, Surgeon to, and Lecturer on Clinical Surgery at, the Westminster Hospital; 1, Argyll street, Regent street. C. 1858-9.

1841 †HILTON, JOHN, F.R.S., Surgeon-Extraordinary to H.M. the Queen; Surgeon to Guy's Hospital; Consulting Surgeon to the Royal General Dispensary, St. Pancras; 10, New Broad street, City. C. 1851. V.P. 1863-4. *Trans.* 4.

1868 HINTON, JAMES, Aural Surgeon to Guy's Hospital; 18, Savile Row. *Trans.* 2.

1859 HIRD, FRANCIS, Surgeon to the Charing Cross Hospital; 13, Old Burlington street.

1861 *HOFFMEISTER, WILLIAM CARTER, M.D., Surgeon to H.M. the Queen in the Isle of Wight; Cowes, Isle of Wight.

1843 HOLDEN, LUTHER, Surgeon to, and Lecturer on Anatomy at, St. Bartholomew's Hospital; Surgeon to the Metropolitan Dispensary; Surgeon to the Foundling Hospital; 65, Gower street, Bedford square. C. 1859. L. 1865.

1814 †HOLLAND, SIR HENRY, Bart., M.D., D.C.L., LL.D., F.R.S., Physician in Ordinary to H.M. the Queen; 72, Brook street, Grosvenor square. C. 1817, 1833-4. V.P. 1826, 1840. *Trans.* 1.

1868 HOLLIS, WILLIAM AINSLIE, M.A., M.B. Camb., 15, Conduit street, Regent street.

1861 HOLMAN, WILLIAM HENRY, M.B. Lond., 68, Adelaide road south, Hampstead.

1856 HOLMES, TIMOTHY, Surgeon to, and Lecturer on Surgery at, St. George's Hospital; Surgeon in Chief to the Metropolitan Police Force; 31, Clarges street, Piccadilly. C. 1869. *Trans.* 4. *Sci. Com.*

1846 HOLT, BARNARD WIGHT, Senior Surgeon to, and Lecturer on Clinical Surgery at, the Westminster Hospital; Medical Officer of Health for Westminster; 14, Savile row, Burlington Gardens. C. 1862-63.

Elected

1846 HOLTHOUSE, CARSTEN, Surgeon to, and Lecturer on Surgery at, the Westminster Hospital; Surgeon to the South London Ophthalmic Hospital; 5, Old Burlington street. C. 1863.

1853 HOOD, SIR WILLIAM CHARLES, M.D., F.L.S., Visiting Physician in Lunacy to the Court of Chancery; Croydon Lodge, Surrey. *Trans.* 1.

1865 HOWARD, BENJAMIN, M.D., Lecturer on Operative Surgery, and Surgeon to the Long Island College Hospital, New York; 327, West 23rd street, New York.

1865 HOWARD, EDWARD, M.D., Oaklands, Penge, Surrey.

1868 HUBBARD, JOHN WADDINGTON, 16, Pembroke gardens, Kensington.

1857 HULKE, JOHN WHITAKER, F.R.S., Assistant-Surgeon to, and Lecturer on Physiology and Ophthalmic Surgery at, the Middlesex Hospital; Surgeon to the Royal London Ophthalmic Hospital, Moorfields; Lecturer on Anatomy and Physiology to the Royal College of Surgeons; 10, Old Burlington street. *Trans.* 4. *Sci. Com.*

1857 HULME, EDWARD CHARLES, Surgeon to the Great Northern Hospital; Surgeon to the Central London Ophthalmic Hospital; 7, John street, Adelphi. *Trans.* 1.

1844 HUMBY, EDWIN, M.D., 83, Hamilton terrace, St. John's wood. C. 1866-7.

1855 HUMPHRY, GEORGE MURRAY, M.D., F.R.S., Surgeon to Addenbrooke's Hospital; Professor of Human Anatomy and Physiology in the Cambridge University Medical School; Cambridge. *Trans.* 5.

1866 HUNTER, CHARLES, 30, Wilton place, Belgrave square.

1849 HUSSEY, EDWARD LAW, Senior Surgeon to the Radcliffe Infirmary, and Consulting Surgeon to the County Lunatic Asylum and the Warneford Asylum; 8, St. Aldate's, Oxford. *Trans.* 1.

1856 HUTCHINSON, JONATHAN, Surgeon to, and Lecturer on Surgery at, the London Hospital; Assistant-Surgeon to the Royal London Ophthalmic Hospital, Moorfields; 4, Finsbury Circus. *Trans.* 2. *Pro.* 2.

1820 HUTCHINSON, WILLIAM, M.D.

Elected

1840 HUTTON, CHARLES, M.D., Senior Physician to the General Lying-in Hospital; 26, Lowndes street, Belgrave square. C. 1858-9.

1866 ILES, FRANCIS HENRY WILSON, M.D., Watford, Herts.

1847 IMAGE, WILLIAM EDMUND, Senior Surgeon to the Suffolk General Hospital; Bury St. Edmund's, Suffolk. *Trans.* 1.

1856 INGLIS, CORNELIUS, M.D., 9, Duke street, Portland place.

1841 †JACKSON, PAUL, 24, Wimpole street, Cavendish square. C. 1862.

1868 JACKSON, THOMAS CARR, Surgeon to the Great Northern Hospital, and Surgeon to the National Orthopædic Hospital; 3, Weymouth street, Portland place.

1863 JACKSON, THOMAS VINCENT, Surgeon to the South Staffordshire General Hospital; Darlington st., Wolverhampton.

1841 JACOBOVICS, MAXIMILIAN MORITZ, M.D., Vienna.

1825 JAMES, JOHN B., M.D.

1844 JEAFFRESON, SAMUEL JOHN, M.D., Consulting Physician to the Warneford Hospital and Warwick Dispensary; Leamington, Warwickshire.

1839 JEFFREYS, JULIUS, F.R.S., Drymona, Belvidere road south, Upper Norwood, Surrey.

1840 *JENKS, GEORGE SAMUEL, M.D., 18, Circus, Bath.

1851 JENNER, SIR WILLIAM, Bart., M.D., D.C.L., F.R.S., Physician in Ordinary to H.M. the Queen, and to H.R.H. the Prince of Wales; Physician to University College Hospital; 63, Brook street, Grosvenor square. C. 1864. *Trans.* 3.

1848 JOHNSON, ATHOL ARCHIBALD WOOD, 20, Regency square, Brighton. *Trans.* 1.

1851 JOHNSON, EDMUND CHARLES, Corresponding Member of the Medical and Philosophical Society of Florence, and of "l'Institut Genevois."

1847 JOHNSON, GEORGE, M.D., Professor of the Principles and Practice of Medicine in King's College, London, and Physician to King's College Hospital; Member of the Senate of the University of London; 11, Savile row, Burlington gardens. C. 1862-4. *Trans.* 8.

Elected

1868 JOHNSTON, WILLIAM, M.D., 44, Princes square, Hyde park.

1862 JONES, CHARLES HANDFIELD, M.B., F.R.S., Physician to, and Lecturer on Medicine at, St. Mary's Hospital; 49, Green street, Grosvenor square.

1844 †JONES, HENRY BENCE, M.A., M.D., F.R.S., 84, Brook street, Grosvenor square. C. 1855-6. V.P. 1866. *Trans.* 11.

1835 †JONES, HENRY DERVICHE, 12, Norfolk crescent, Oxford square. C. 1854-5.

1837 †JONES, THOMAS WILLIAM, M.D., 55, St. John's Park, Upper Holloway, and 3, North buildings, Finsbury. C. 1858.

1859 JONES, WILLIAM PRICE, M.D., Surbiton, Kingston.

1865 JORDAN, FURNEAUX, Surgeon to the Queen's Hospital, and Senior Surgeon to the Birmingham Eye and Ear Hospital; Medical Inspector of Factories; 16, Colmore row, Birmingham.

1816 *KAUFFMANN, GEORGE HERMANN, M.D., Hanover.

1848 *KENDELL, DANIEL BURTON, M.D., Kettlethorpe Hall, Wakefield, Yorkshire.

1847 KEYSER, ALFRED, 21, Norfolk crescent, Oxford square.

1857 KIALLMARK, HENRY WALTER, 66, Princes square, Bayswater.

1851 KINGDON, JOHN ABERNETHY, Surgeon to the City of London Truss Society, and to the City Dispensary; 2, New Bank buildings, Lothbury. C. 1866-7. *Trans.* 1. *Sci. Com.*

1855 LANE, JAMES ROBERT, Surgeon to, and Lecturer on Surgery at, St. Mary's Hospital; Surgeon to the Lock Hospital; 2, Berkeley street, Piccadilly. *Trans.* 1.

1840 LANE, SAMUEL ARMSTRONG, Surgeon to, and Lecturer on Clinical Surgery at, St. Mary's Hospital; Consulting Surgeon to the Lock Hospital; 2, Berkeley street, Piccadilly. C. 1849-50. V.P. 1865.

Elected

1865 LANGTON, JOHN, Assistant-Surgeon to, and Demonstrator of Anatomy at, St. Bartholomew's Hospital; Assistant Surgeon to the City of London Truss Society; the College, St. Bartholomew's Hospital.

1841 *LASHMAR, CHARLES, M.D., 83, North End, Croydon, Surrey.

1862 LATHAM, PETER WALLWORK, M.A., M.B., Physician to Addenbrooke's Hospital, Cambridge; Examiner for Medical Degrees in Cambridge University; 15, Sidney street, Cambridge.

1816 LAWRENCE, G. E.

1840 LAYCOCK, THOMAS, M.D., F.R.S.E., Physician-in-Ordinary to H.M. the Queen in Scotland, Professor of the Practice of Medicine and of Clinical Medicine, and Lecturer on Psychology and Mental Diseases, in the University of Edinburgh; Physician to the Edinburgh Royal Infirmary; 4, Rutland street, Edinburgh.

1843 *LEACH, JESSE, Moss Hall, Heywood, near Bury, Lancashire.

1868 LEARED, ARTHUR, M.D., Senior Physician to the Great Northern Hospital; 12, Old Burlington street.

1822 LEDSAM, JOHN JOSEPH, M.D., 17, Esplanade, Scarborough, Yorkshire.

1843 LEE, HENRY, *Vice-President*, Surgeon to, and Lecturer on Pathology at, St. George's Hospital; 9, Savile row, Burlington gardens. C. 1856-7. L. 1863-4. V.P. 1868-9. *Trans.* 11. *Pro.* 1. *Sci. Com.*

1822 †LEE, ROBERT, M.D., F.R.S., Corresponding Member of the Imperial Academy of Medicine, Paris; 4, Savile row, Burlington gardens. C. 1829, 1834. S. 1830-3. V.P. 1835. *Trans.* 27.

1869 LEGG, JOHN WICKHAM, M.D., 11, South street, Park lane.

1836 LEIGHTON, FREDERICK, M.D., Frankfort-on-the-Maine.

1806 LIND, JOHN, M.D.

1819 LLOYD, ROBERT, M.D.

1820 LOCHER, J. G., M.C.D., Town Physician of Zurich. *Trans.* 2.

Elected

1824 †Locock, Sir Charles, Bart., M.D., D.C.L., F.R.S., First Physician-Accoucheur to H.M. the Queen; Member of the Senate of the University of London; 26, Hertford street, May fair. C. 1826. V.P. 1841. P. 1857-8. *Trans.* 1.

1852 Lodge, Charles, M.D., "United States Army."

1846 Lomax, Henry Thomas, Surgeon to the County Police; St. Mary's Grove, Stafford.

1860 Longmore, Thomas, C.B., Hon. Surgeon to H.M. the Queen, Deputy Inspector-General, and Professor of Clinical and Military Surgery, New Army Medical School, Royal Victoria Hospital, Netley, Southampton. *Trans.* 2.

1836 Löwenfeld, Joseph S., M.D., Berbice.

1852 Luke, James, F.R.S., Consulting Surgeon to the London Hospital, Woolley Lodge, Maidenhead Thicket, Berks. C. 1858. *Trans.* 4.

1857 Lyon, Felix William, M.D.

1867 Maberly, George Frederick, Hillside, Godalming, Surrey.

1867 *Mac Cormac, William, M.A., M.D. Dublin, 4, Howard street, Belfast.

1862 *M'Donnell, Robert, M.D., F.R.S., Surgeon to Steevens' Hospital; 14, Lower Pembroke street, Dublin. *Trans.* 1.

1846 M'Ewen, William, M.D., Surgeon to Chester Castle; 27, Nicholas street, Chester.

1866 Macgowan, Alexander Thorburn, Kingswood park, near Bristol.

1823 †Macilwain, George, Consulting Surgeon to the Finsbury Dispensary, and to the St. Anne's Society's Schools; 3, Albany Court yard. C. 1829-30. V.P. 1848. *Trans.* 1.

1822 Macintosh, Richard, M.D.

1859 *M'Intyre, John, M.D., Odiham, Hants.

1854 *Mackinder, Draper, M.D., Consulting Surgeon to the Dispensary, Gainsborough, Lincolnshire.

Elected

1844 MACLACHLAN, DANIEL, M.D., Deputy Inspector-General of Hospitals; Ventnor, Isle of Wight. C. 1860-1. *Trans.* 1.

1860 MACLEAN, JOHN, M.D., 24, Portman street, Portman square.

1849 MACLURE, DUNCAN MACLACHLAN, M.B., Lecturer on Physiology at the Westminster Hospital; 34, Harley street, Cavendish square.

1842 MACNAUGHT, JOHN, M.D., Bedford street, Liverpool.

1855 MARCET, WILLIAM, M.D., F.R.S., Assistant-Physician to the Brompton Hospital for Consumption; 48, Harley street. *Trans.* 2. *Sci. Com.*

1848 MARKHAM, WILLIAM ORLANDO, M.D., Poor Law Inspector for the Metropolitan District; 8, Harley street, Cavendish square. C. 1862-3. *Trans.* 2.

1867 MARSH, F. HOWARD, Demonstrator of Anatomy at St. Bartholomew's Hospital, and Assistant-Surgeon to the Hospital for Sick Children; 4, Furnival's inn, Holborn.

1838 MARSH, THOMAS PARR, M.D.

1851 MARSHALL, JOHN, F.R.S., Professor of Surgery in University College, London, and Surgeon to University College Hospital; 10, Savile Row, Burlington gardens. C. 1866. *Trans.* 2.

1841 MARTIN, SIR JAMES RANALD, C.B., F.R.S., Examining Medical Officer to the Secretary of State for India in Council; President of Medical Board for Examination of Officers of H.M.'s Indian Medical Service; Inspector General of Hospitals; 37, Upper Brook street, Grosvenor square. C. 1853. V.P. 1862.

1853 MASFEN, WILLIAM EDWARD, Surgeon to the Staffordshire General Infirmary; Stafford.

1864 MASON, FRANCIS, Assistant-Surgeon to, and Lecturer on Anatomy at, the Westminster Hospital; 10, Conduit street, Regent street.

1869 MAYO, CHARLES, M.B., 7, Princes Street, Hanover Square.

1837 MAYO, THOMAS, M.D., F.R.S., the Refuge, Yarmouth, Isle of Wight. S. 1841. C. 1847-8. V.P., 1851-2.

1839 MEADE, RICHARD HENRY, Senior Surgeon to the Bradford Infirmary; Bradford, Yorkshire. *Trans.* 1.

Elected

1865 MEDWIN, AARON GEORGE, M.D., 11, Montpellier row, Blackheath, Kent.

1867 MEREDYTH, COLOMIATI, M.D., 76, Margaret street, Cavendish square.

1837 MERRIMAN, SAMUEL WILLIAM JOHN, M.D., Consulting Physician-Accoucheur to the Westminster General Dispensary; Marlboro' House, Sandown, Isle of Wight. C. 1851-2. *Trans.* 1.

1852 MERRYWEATHER, JAMES, Consulting Surgeon to the National Dental Hospital; 25, Brook street, Grosvenor square.

1847 MERYON, EDWARD, M.D., F.G.S., *Vice-President*; 14, Clarges street, Piccadilly. L. 1859-60. C. 1864-5. V.P. 1868-9. *Trans.* 2.

1815 MEYER, AUGUSTUS, M.D., St. Petersburgh.

1868 MICHELL, WILLIAM DANIEL, 38, Delancey street, Gloucester gate, Regent's park.

1840 MIDDLEMORE, RICHARD, Consulting Surgeon to the Birmingham Eye Infirmary; Temple row, Birmingham.

1854 MIDDLESHIP, EDWARD ARCHIBALD, late of Richmond, Surrey.

1860 *MILES, HERBERT CHALMERS, Surgeon in the Royal Horse Artillery, India [per John Miles, M.D., Carlisle villas, Eastbourne].

1818 *MILLER, PATRICK, M.D., F.R.S.E., Senior Physician to the Devon and Exeter Hospital, and to St. Thomas's Hospital for Lunatics; the Grove, Exeter, Devonshire.

1863 MONRO, HENRY, M.D., Physician to St. Luke's Hospital; 13, Cavendish square. C. 1868.

1844 MONTEFIORE, NATHANIEL, 36, Hyde park gardens.

1848 MOORE, CHARLES HEWITT, *Treasurer*, Surgeon to, and Lecturer on Surgery at, the Middlesex Hospital, and Surgeon to St. Luke's Hospital; 102, Piccadilly. L. 1858. S. 1859-62. C. 1864-5. V.P. 1866-7. T. 1868-9. *Trans.* 10. *Sci. Com.*

1836 MOORE, GEORGE, M.D., Hastings, Sussex.

Elected

1861 MOREHEAD, CHARLES, M.D., Hon. Surgeon to H.M. the Queen; Deputy-Inspector General of Hospitals; 6, Chester street, Edinburgh.

1857 MORGAN, JOHN, 3, Sussex place, Hyde park gardens. *Trans.* 1.

1861 MORGAN, JOHN EDWARD, M.B., Physician to the Manchester Royal Infirmary, and Lecturer on Medicine at the Manchester Royal School of Medicine; 3, Gore street, Piccadilly, Manchester.

1851 MOUAT, FREDERIC JOHN, M.D., Surgeon-Major, Bengal Army; late Inspector-General of Gaols in the Lower Provinces of the Bengal Presidency, and Member of the Senate of the University of Calcutta.

1868 MOXON, WALTER, M.D., F.L.S., Assistant-Physician to, and Lecturer on Morbid Anatomy at, Guy's Hospital; 6, Finsbury circus.

1856 MURCHISON, CHARLES, M.D., F.R.S., Senior Physician to the London Fever Hospital; Physician to, and Lecturer on the Practice of Medicine at, the Middlesex Hospital; 79, Wimpole street, Cavendish square. *Trans.* 3.

1847 MURCHISON, SIMON, Bicester, Oxon.

1863 MYERS, ARTHUR B. R., Coldstream Guards' Hospital, Vincent square, Westminster.

1859 NAYLER, GEORGE, Assistant-Surgeon to the Hospital for Diseases of the Skin, Blackfriars; 3, Savile row.

1835 †NELSON, THOMAS ANDREW., M.D., 10, Nottingham terrace, York gate, Regent's park.

1843 NEWTON, EDWARD, 4, Upper Wimpole street. C. 1863-4.

1868 NICHOLLS, JAMES, M.D., Chelmsford, Essex.

1849 NORMAN, HENRY BURFORD, Portland Lodge, Southsea, Hants.

1845 NORRIS, HENRY, Charmouth, Dorset.

1847 *NOURSE, WILLIAM EDWARD CHARLES, 11, Marlborough place, Brighton.

1849 NOVERRE, ARTHUR, 16, Park street, Grosvenor square.

1864 NUNN, THOMAS WILLIAM, Surgeon to, and Lecturer on Surgery at, the Middlesex Hospital; 8, Stratford place, Oxford street.

Elected

1859 *NUNNELEY, THOMAS, Senior Surgeon to the Leeds Eye and Ear Infirmary; Leeds. *Trans.* 3.

1847 O'CONNOR, THOMAS, March, Cambridgeshire.

1843 O'CONNOR, WILLIAM, M.D., Senior Physician to the Royal Free Hospital; 30, Upper Montagu street, Montagu square.

1858 OGLE, JOHN WILLIAM, M.D., Physician to, and Lecturer on Pathology at, St. George's Hospital; 13, Upper Brook street, Grosvenor square, *Trans.* 4.

1855 *OGLE, WILLIAM, M.A., M.D., Physician to the Derby Infirmary; 3, Stewart terrace, Derby.

1860 OGLE, WILLIAM, M.D., *Secretary*, Assistant-Physician to, and Lecturer on Physiology at, St. George's Hospital; 34, Clarges street, Piccadilly. S. 1868-9. *Trans.* 1.

1850 OLDHAM, HENRY, M.D., Consulting Obstetric Physician to Guy's Hospital; 26, Finsbury square. C. 1865. *Trans.* 1.

1846 *ORMEROD, EDWARD LATHAM, M.D., Physician to the Sussex County Hospital; 14, Old Steine, Brighton. *Trans.* 2.

1847 *PAGE, WILLIAM BOUSFIELD, Surgeon to the Cumberland Infirmary; Carlisle. *Trans.* 2.

1840 †PAGET, JAMES, D.C.L., F.R.S., Sergeant-Surgeon Extraordinary to H.M. the Queen; Surgeon-in-Ordinary to H.R.H. the Prince of Wales; Surgeon to St. Bartholomew's Hospital; Surgeon to Christ's Hospital; Member of the Senate of the University of London; 1, Harewood place, Hanover square. C. 1848-49. V.P. 1861. T. 1867. *Trans.* 8. *Sci. Com.*

1858 *PALEY, WILLIAM, M.D., Physician to the Ripon Dispensary; Ripon, Yorkshire.

1836 PARKER, LANGSTON, Hon. Surgeon to the Queen's Hospital, Birmingham; Colmore row, Birmingham.

1847 PARKER, NICHOLAS, M.D., Paris.

1841 PARKIN, JOHN, M.D., Rome.

Elected

1851 PART, JAMES, M.D., 89, Camden road, Camden town.

1828 †PARTRIDGE, RICHARD, F.R.S., Professor of Anatomy to the Royal Academy of Arts; Surgeon to King's College Hospital, and Professor of Anatomy in King's College, London; 17, New street, Spring gardens. S. 1832-6. C. 1837-8, 1861-2. V.P. 1847-8. P. 1863-4.

1865 PAVY, FREDERICK WILLIAM, M.D., F.R.S., Assistant-Physician to, and Lecturer on Physiology and Comparative Anatomy at, Guy's Hospital; 35, Grosvenor street.

1869 PAYNE, JOSEPH FRANK, M.B., Assistant-Physician to the Hospital for Sick Children; Physician to St. George's Dispensary; 50, Green street, Park lane.

1845 PEACOCK, THOMAS BEVILL, M.D., Physician to, and Lecturer on Medicine at, St. Thomas's Hospital; Physician to the City of London Hospital for Diseases of the Chest, Victoria Park; 20, Finsbury circus. S. 1855-6. V.P. 1867. C. 1869. *Trans.* 2.

1864 PEARSON, DAVID RITCHIE, M.D., 23, Upper Phillimore place, Kensington.

1856 PEIRCE, RICHARD KING, 16, Norland place, Notting hill.

1830 PELECHIN, CHARLES P., M.D., St. Petersburgh.

1855 *PEMBERTON, OLIVER, Surgeon to the Birmingham General Hospital, and Lecturer on Surgical Pathology at Sydenham College; 18, Temple row, Birmingham. *Trans.* 1.

1852 PHILLIPS, RICHARD, 52, Leinster square, Westbourne grove.

1854 PHILLIPS, THOMAS BACON, M.D., Physician to the Brighton and Hove Dispensary; 36, Lansdowne place, Brighton.

1846 PHILP, FRANCIS RICHARD, M.D., Colby House, Kensington, and Sherborne House, Harrogate, Yorkshire.

1867 PICK, THOMAS PICKERING, Assistant-Surgeon to St. George's Hospital; 9, Bolton row, Mayfair.

1851 *PICKFORD, JAMES HOLLINS, M.D., M.R.I.A., 1, Cavendish place, Brighton.

Elected

1841 PITMAN, HENRY ALFRED, M.D., Consulting Physician to St. George's Hospital, and to the Royal General Dispensary, St. Pancras; 28, Gordon square. L. 1851-3. C. 1861-2. T. 1863-8.

1850 POLAND, ALFRED, Surgeon to Guy's Hospital, and to the Eye Infirmary attached to the Hospital; 48, Finsbury circus. C. 1865-6. *Trans.* 1,

1845 POLLOCK, GEORGE DAVID, Surgeon in Ordinary to H.R.H. the Prince of Wales; Surgeon to St. George's Hospital; 36, Grosvenor street. C. 1856-7. L. 1859-62. *Trans.* 2.

1865 POLLOCK, JAMES EDWARD, M.D., Physician to the Hospital for Consumption, Brompton; 52, Upper Brook street, Grosvenor square.

1843 POPE, CHARLES, M.D., Glastonbury, Somersetshire.

1846 POTTER, JEPHSON, M.D., F.L.S., Physician to the Liverpool General Hospital for Consumption and Diseases of the Chest; 3, Brooklands, Southport, and 6, Soho street, Liverpool.

1842 POWELL, JAMES, M.D.

1867 POWELL, RICHARD DOUGLAS, M.D., Assistant-Physician to the Hospital for Consumption, Brompton; 6, Nottingham place, Marylebone road.

1867 POWER, HENRY, Ophthalmic Surgeon to, and Lecturer on Ophthalmic Surgery at, St. George's Hospital; Examiner in Physiology at the University of London; 45, Seymour street, Portman square.

1851 POWER, ROBERT FRANCIS, M.D., 71, Gloucester place, Portman square.

1857 PRIESTLEY, WILLIAM OVEREND, M.D., Physician-Accoucheur to H.R.H. the Princess Louis of Hesse; Professor of Midwifery in King's College, London, and Physician for the Diseases of Women and Children to King's College Hospital; Examiner in Midwifery at the University of London; Consulting Physician-Accoucheur to the St. Marylebone Infirmary; 17, Hertford street, Mayfair. *Sci. Com.*

Elected

1869 PULLAR, ALFRED, M.D., 28, Harley street, Cavendish square.

1845 PYLE, JOHN, 59, Oxford terrace, Hyde park. C. 1860.

1850 QUAIN, RICHARD, M.D., Physician to the Hospital for Consumption and Diseases of the Chest; Member of the Senate of the University of London; 67, Harley street, Cavendish square. C. 1866-7. *Trans.* 1. *Sci. Com.*

1835 †QUAIN, RICHARD, F.R.S., Surgeon Extraordinary to H.M. the Queen; Emeritus Professor of Clinical Surgery, University College, London, and Consulting Surgeon to the Eye Infirmary attached to the Hospital; 32, Cavendish square. C. 1838-9. L. 1846-8. T. 1851-3. V.P. 1856-7. *Trans.* 1. *Pro.* 2.

1852 RADCLIFFE, CHARLES BLAND, M.D., Physician to, and Lecturer on Materia Medica at, the Westminster Hospital; Physician to the National Hospital for the Paralysed and Epileptic; 25, Cavendish square. C. 1867-8.

1857 RANKE, HENRY, M.D., Munich.

1854 RANSOM, WILLIAM HENRY, M.D., Physician to the Nottingham General Hospital; the Pavement, Nottingham.

1869 READ, THOMAS LAURENCE, 11, Petersham terrace, Queen's gate, Kensington.

1858 REED, FREDERICK GEORGE, M.D., 46, Hertford street, May fair. *Trans.* 1.

1821 REEDER, HENRY, M.D., Varick, Seneca County, New York, United States.

1857 REES, GEORGE OWEN, M.D., F.R.S., Physician to, and Lecturer on Medicine at, Guy's Hospital; 26, Albemarle street, Piccadilly. *Trans.* 1.

1868 REEVE, JOHN FOSTER, M.D., 40, Brook street, Grosvenor square.

1869 REEVES, WILLIAM, the Crescent, Carlisle.

1855 REYNOLDS, JOHN RUSSELL, M.D., F.R.S., Professor of the Principles and Practice of Medicine in University College, London, and Physician to University College Hospital; Examiner in Medicine at the University of London; 38, Grosvenor street.

Elected

1865 RHODES, GEORGE WINTER, Surgeon to the Huddersfield Infirmary; 30, Ramsden street, Huddersfield.

1847 RICHARDS, SAMUEL, M.D., 36, Bedford square.

1852 RICHARDSON, CHRISTOPHER THOMAS, M.B., Warcop, Penrith.

1849 *RICHARDSON, WILLIAM, M.D., 25, Gloucester gardens, Bishop's road, Hyde park.

1869 RICKARDS, WALTER, M.D., Physician to the Royal Free Hospital; 8, Cavendish place, Cavendish square.

1845 RIDGE, BENJAMIN, M.D., 21, Bruton street, Berkeley square.

1843 RIDGE, JOSEPH, M.D., 39, Dorset square. C. 1858. *Pro.* 1.

1863 RINGER, SYDNEY, M.D., Professor of Materia Medica in University College, London, and Physician to University College Hospital; Assistant-Physician to the Hospital for Sick Children; 15, Cavendish place, Cavendish square.

1852 ROBERTS, JOHN, M.R.C.P., the Park, Westow hill, Upper Norwood.

1855 ROBERTSON, CHARLES ALEXANDER LOCKHART, M.D., Medical Superintendent of the Sussex County Lunatic Asylum; Hayward's heath, Sussex.

1857 ROBERTSON, JOHN CHARLES GEORGE, Medical Superintendent of the Cavan District Lunatic Asylum; Monaghan, Ireland.

1862 ROBINSON, CHARLES, F.R.C.P. Edinb., 11, Montagu street, Portman square.

1843 ROBINSON, GEORGE, M.D. *Trans.* 2.

1843 RODEN, WILLIAM, M.D., the Grange, Kidderminster, Worcestershire.

1835 †ROE, GEORGE HAMILTON, M.D., Consulting Physician to the Hospital for Consumption and Diseases of the Chest; 124, Park street, Grosvenor square. C. 1841-2. *Trans.* 1.

1836 †ROGERS, ARNOLD, Consulting Surgeon-Dentist to St. Bartholomew's Hospital; 16, Hanover square.

1829 ROOTS, WILLIAM SUDLOW, F.L.S., Surgeon to the Royal Establishment at Hampton Court; Kingston, Surrey.

1850 ROPER, GEORGE, Bank house, Aylsham, Norfolk.

Elected

1855 Roscow, Thomas Tattersall, M.D.

1836 *Rose, Caleb Bŭrrell, F.G.S., 25, King street, Great Yarmouth, Norfolk. *Trans.* 1.

1857 Rose, Henry Cooper, M.D., F.L.S., Surgeon to the Hampstead Dispensary; High street, Hampstead. *Trans.* 1.

1849 Routh, Charles Henry Felix, M.D., Physician to the Samaritan Free Hospital for Women and Children; 52, Montagu square *Trans.* 1.

1863 Rowe, Thomas Smith, M.D., Surgeon to the Royal Seabathing Infirmary; Cecil street, Margate, Kent.

1834 Rumsey, Henry Wyldbore, Wolseley House, Cheltenham.

1845 Russell, James, M.D., Physician to the Birmingham General Hospital, and Lecturer on Pathology and Therapeutics at Sydenham College; 91, New Hall street, Birmingham.

1851 Salter, Henry Hyde, M.D., F.R.S., Physician to, and Lecturer on Medicine at, the Charing Cross Hospital; 14, Harley street, Cavendish square. S. 1866. C. 1868-9. *Sci. Com.*

1856 Salter, Samuel James A., F.R.S., F.L.S., Surgeon-Dentist to, and Lecturer on Dental Surgery at, Guy's Hospital; 17, New Broad street, City. *Trans.* 2.

1849 Sánderson, Hugh James, M.D., Physician to the Hospital for Women; 26, Upper Berkeley street, Portman square.

1855 Sanderson, John Burdon, M.D., F.R.S., Assistant-Physician to, and Lecturer on Physiology at, the Middlesex Hospital; Physician to the Hospital for Consumption, Brompton; 49, Queen Anne street, Cavendish square. C. 1869. *Trans.* 1. *Sci. Com.*

1867 Sandford, Folliott James, M.D., Market Drayton, Shropshire.

1847 Sankey, William Henry Octavius, M.D., Lecturer on Mental Diseases at University College, London; Sandywell park, near Cheltenham.

1869 Sansom, Arthur Ernest, M.D., 29, Duncan terrace, Islington. *Trans.* 1.

Elected

1845 SAUNDERS, EDWIN, Surgeon-Dentist to H.M. the Queen, and to H.R.H. the Prince of Wales; 13A, George street, Hanover square.

1834 SAUVAN, LUDWIG V., M.D., Warsaw.

1859 SAVORY, WILLIAM SCOVELL, F.R.S., Surgeon to, and Lecturer on Surgery at, St. Bartholomew's Hospital; 66, Brook st., Grosvenor square. *Trans.* 3. *Sci. Com.* 2.

1853 SCHULHOF, MAURICE, M.D., Physician to the Royal General Dispensary, Bartholomew close; 46, Brook street, Grosvenor square.

1861 *SCOTT, WILLIAM, M.D., Physician to the Huddersfield Infirmary; 12, New North road, Huddersfield.

1858 *SCRATCHLEY, GEORGE, M.D., New Orleans, Louisiana, U.S. [per Arthur Scratchley, Esq., 8A, Waterloo place, Pall Mall].

1863 SEDGWICK, WILLIAM, Surgeon to the St. Marylebone Provident Dispensary; 12, Park place, Upper Baker street. *Trans.* 1.

1856 SERCOMBE, EDWIN, Surgeon-Dentist to St. Mary's Hospital; 41, Brook street, Grosvenor square. *Trans.* 1. *Pro.* 1.

1840 SHARP, WILLIAM, M.D., F.R.S., Horton House, Rugby. *Trans.* 1.

1837 †SHARPEY, WILLIAM, M.D., F.R.S., LL.D., Professor of Anatomy and Physiology in University College, London; Member of the Senate of the University of London; Secretary of the Royal Society; University College, and Lawnbank, Hampstead. C. 1848-9. V.P. 1862.

1836 †SHAW, ALEXANDER, Consulting Surgeon to the Middlesex Hospital; 40, Abbey road west, Kilburn. C. 1842. S. 1843-4. V.P. 1851-2. T. 1858-60. *Trans.* 4.

1848 *SHEARMAN, EDWARD JAMES, M.D., Moorgate, Rotherham, Yorkshire.

1859 SIBLEY, SEPTIMUS WILLIAM; 12, New Burlington street. *Trans.* 4. *Sci. Com.*

1849 SIBSON, FRANCIS, M.D., F.R.S., Physician to, and Lecturer on Clinical Medicine at, St. Mary's Hospital; Member of the Senate of the University of London; 59, Brook street, Grosvenor sq. C. 1863-4. *Trans.* 1. *Sci. Com.*

Elected

1848 SIEVEKING, EDWARD HENRY, M.D., Physician in Ordinary to H.R.H. the Prince of Wales; Physician to, and Lecturer on Materia Medica at, St. Mary's Hospital; 17, Manchester square. C. 1859-60. S. 1861-3. *Trans.* 2. *Sci. Com.*

1842 SIMON, JOHN, D.C.L., F.R.S., Surgeon to, and Lecturer on General Pathology at, St. Thomas's Hospital; Medical Officer of the Privy Council; 8, Richmond terrace, Whitehall, and 40, Kensington square. C. 1854-5. V.P. 1865. *Trans.* 1.

1865 SIMS, J. MARION, M.D., 47, Faubourg St. Honoré, Paris.

1857 SIORDET, JAMES LEWIS, M.B., Mentone.

1824 †SKEY, FREDERIC CARPENTER, C.B., F.R.S., Consulting Surgeon to, and Lecturer on Clinical Surgery at, St. Bartholomew's Hospital; 24, Mount street, Grosvenor square. C. 1828. L. 1829-31. V.P. 1841-2. P. 1859-60. *Trans.* 1.

1852 SMITH, CHARLES CASE, Consulting Surgeon to the Suffolk General Hospital.

1866 SMITH, HEYWOOD, M.A., M.B., Oxon., Assistant-Physician to the Hospital for Women; 42, Park street, Grosvenor square.

1835 SMITH, JOHN GREGORY, 13, New Burlington street.

1843 SMITH, ROBERT WILLIAM, M.D., M.R.I.A., Professor of Surgery in the University of Dublin; Surgeon to the Richmond Hospital; 63, Eccles street, Dublin.

1838 †SMITH, SPENCER, Surgeon to, and Lecturer on Surgery at, St. Mary's Hospital; 9, Queen Anne street, Cavendish square. C. 1854. S. 1855-8. V.P. 1859-60. T. 1865.

1863 SMITH, THOMAS, Assistant-Surgeon to St. Bartholomew's Hospital; Surgeon to the Hospital for Sick Children; 5, Stratford place, Oxford street. *Trans.* 2. *Sci. Com.*

1864 *SMITH, THOMAS HECKSTALL, Rowlands, St. Mary Cray, Kent.

1845 SMITH, WILLIAM, Sherwood Villa, Pembroke road, Clifton, Bristol. *Trans.* 1.

Elected

1847 SMITH, WILLIAM, M.D., Consulting Physician to the Weymouth Infirmary; Weymouth, Dorsetshire.

1850 SMITH, WILLIAM TYLER, M.D., Physician-Accoucheur to, and Lecturer on Midwifery at, St. Mary's Hospital; 21, Upper Grosvenor street. C. 1867-8. *Trans.* 2.

1851 SODEN, JOHN. *Trans.* 2.

1830 †SOLLY, SAMUEL, F.R.S., Senior Surgeon to, and Lecturer on Surgery at, St. Thomas's Hospital; Consulting Surgeon to the Royal General Dispensary, Bartholomew close; 6, Savile row, Burlington gardens. L. 1838-40. C. 1845-6. V.P. 1849-50. P. 1867-8. *Trans.* 6.

1868 SOLLY, SAMUEL EDWIN, 6, Savile row, Burlington gardens.

1865 SOUTHAM, GEORGE, Surgeon to the Manchester Royal Infirmary; 21, Lever street, and Oakfield, Pendleton, Manchester. *Trans.* 4.

1865 SOUTHEY, REGINALD, M.B., Assistant-Physician, and Medical Registrar, to St. Bartholomew's Hospital; Physician to the Royal General Dispensary; 32, Montague place, Russell square.

1844 SPACKMAN, FREDERICK R., M.D., Harpenden, St. Albans.

1834 SPARK, JAMES, Italy.

1851 SPITTA, ROBERT JOHN, M.B., Medical Officer to the Clapham General Dispensary; Clapham Common, Surrey. *Trans.* 1.

1843 *SPRANGER, STEPHEN, Hursley, Hampshire.

1867 SQUAREY, CHARLES EDWARD, M.B., Assistant-Physician to the Hospital for Women; 13, Upper Wimpole street. *Trans.* 2.

1851 STARTIN, JAMES, Surgeon to, and Lecturer on Cutaneous Disorders at, the Hospital for Diseases of the Skin, Blackfriars; 3, Savile row, Burlington gardens.

1854 STEVENS, HENRY, M.D. Lond., Lion Hotel, Shrewsbury.

1842 STEWART, ALEXANDER PATRICK, M.D., Consulting Physician to the Middlesex Hospital; 75, Grosvenor street. C. 1856-7. L. 1863-8.

1859 STEWART, WILLIAM EDWARD, 12, Weymouth street, Portland place.

Elected

1856 STOCKER, ALONZO HENRY, M.D., Resident Medical Superintendent of Grove Hall Lunatic Asylum, Bow.

1865 STOKES, WILLIAM, Jun., M.D., 5, Merrion square north, Dublin.

1843 STORKS, ROBERT REEVE, Paris.

1858 †STREATFEILD, JOHN FREMLYN, Surgeon to the Royal London Ophthalmic Hospital, Moorfields, 15, Upper Brook street, Grosvenor square.

1863 STURGES, OCTAVIUS, M.D., Assistant-Physician to, and Lecturer on Forensic Medicine at, the Westminster Hospital; Physician to the Chelsea, Brompton, and Belgrave Dispensary; 85, Wimpole street, Cavendish square.

1860 SUTRO, SIGISMUND, M.D., Senior Physician to the German Hospital; 37A, Finsbury square.

1855 SUTTON, JOHN MAULE, M.D.

1861 *SWEETING, GEORGE BACON, King's Lynn, Norfolk.

1842 SYME, JAMES, D.C.L., F.R.S.E., Surgeon in Ordinary to H.M. the Queen in Scotland; Consulting Surgeon to the Edinburgh Royal Infirmary; 1, Shandwick place, Edinburgh. *Trans.* 5.

1854 *SYMONDS, FREDERICK, Surgeon to the Radcliffe Infirmary, and Consulting Surgeon to the Oxford Dispensary; 32, Beaumont street, Oxford.

1844 TAMPLIN, RICHARD WILLIAM, Surgeon to the Royal Orthopædic Hospital; 33, Old Burlington street.

1848 TANNER, THOMAS HAWKES, M.D., F.L.S., 9, Henrietta street, Cavendish square.

1864 TAUSSIG, GABRIEL, M.D., 70, Piazza Barberini, Rome.

1852 TAYLOR, ROBERT, Surgeon to the Central London Ophthalmic Hospital, and to the Cripples' Home, Hill street; 7, Lower Seymour street, Portman square.

1845 TAYLOR, THOMAS, Lecturer on Chemistry at the Middlesex Hospital Medical School; 1, Warwick place, Grove End road.

1859 TEGART, EDWARD, 49, Jermyn street, St. James's.

Elected

1862 THOMPSON, EDMUND SYMES, M.D., Assistant-Physician to the Hospital for Consumption, Brompton; 3, Upper George street, Portman square.

1857 THOMPSON, HENRY, M.D., Physician to the Middlesex Hospital; 52, Welbeck street, Cavendish square.

1852 THOMPSON, SIR HENRY, Surgeon Extraordinary to H.M. the King of the Belgians; Professor of Clinical Surgery in University College, London, and Surgeon to University College Hospital; 35, Wimpole street, Cavendish square. C. 1869. *Trans.* 3.

1862 THOMPSON, REGINALD EDWARD, M.D., Medical Registrar to St. George's Hospital; Physician to the St. George's and St. James's Dispensary; 21, South street, Park lane. *Trans.* 1. *Sci. Com.*

1836 THURNAM, JOHN, M.D., Resident Medical Superintendent of the Wilts County Asylum, Devizes, Wiltshire. *Trans.* 4.

1848 TILT, EDWARD JOHN, M.D., Consulting Physician to the Farringdon General Dispensary and Lying-in Charity; 60, Grosvenor street.

1867 TONGE, MORRIS, M.D., Harrow on the Hill, Middlesex.

1828 TORRIE, JAMES, M.D.

1867 TROTTER, JOHN WILLIAM, Assistant-Surgeon, Coldstream Guards; Hospital, Vincent square, Westminster.

1859 TRUMAN, EDWIN THOMAS, Surgeon-Dentist in Ordinary to Her Majesty's Household; 23, Old Burlington street.

1864 TUFNELL, THOMAS JOLLIFFE, Examiner in Surgery to the Royal College of Surgeons of Ireland; 58, Lower Mount street, Merrion square, Dublin.

1862 TUKE, THOMAS HARRINGTON, M.D., Manor House, Chiswick, and 37, Albemarle street, Piccadilly.

1855 TULLOCH, JAMES STEWART, M.D., 1, Pembridge place, Bayswater.

1864 TURNER, GEORGE, 9, Sussex gardens, Hyde park.

1845 TURNER, THOMAS, F.L.S., Consulting Surgeon to the Manchester Royal Infirmary; 77, Mosley street, Manchester.

1806 VAUX, BOWYER, Teignmouth, Devon.

Elected

1865 VERNON, BOWATER JOHN, Assistant-Demonstrator of Anatomy, St. Bartholomew's Hospital; 93, Wimpole street, Cavendish square.

1867 VINTRAS, ACHILLE, M.D., Physician to the French Hospital, Lisle street, Leicester square; 141, Regent street.

1828 VULPES, BENEDETTO, M.D., Physician to the Hospital of Aversa, and the Hospital of Incurables, Naples.

1854 WADDINGTON, EDWARD.

1841 WADE, ROBERT, Senior Surgeon to the Westminster General Dispensary; 68, Dean street, Soho. *Trans.* 1.

1864 WAITE, CHARLES DERBY, M.B., 3, Old Burlington Street.

1868 *WALKER, ROBERT, L.R.C.P. Ed., Surgeon to the Carlisle Dispensary; 25, Lowther street, Carlisle.

1867 *WALLIS, GEORGE, Benet street, Cambridge.

1861 *WALSH, JAMES, M.D., Staff-Surgeon, R.N., 41, Cathrine street, Limerick, Ireland.

1852 WALSHE, WALTER HAYLE, M.D., Emeritus Professor of the Principles and Practice of Medicine, University College, London; Consulting Physician to the Hospital for Consumption; 37, Queen Anne street, Cavendish square. *Trans.* 1.

1851 WALTON, HENRY HAYNES, Surgeon to St. Mary's Hospital and to the Ophthalmic Department; 1, Brook street, Hanover square. *Trans.* 1. *Pro.* 1.

1852 WANE, DANIEL, M.D., 20, Grafton street, Berkeley square.

1821 WARD, WILLIAM TILLEARD.

1858 WARDELL, JOHN RICHARD, M.D., 4, Belmont, Tunbridge Wells.

1846 WARE, JAMES THOMAS, Consulting Surgeon to the Finsbury Dispensary, and Hon. Surgeon to the Metropolitan Convalescent Institution; 18, Gordon square, and Tilford house, near Farnham, Surrey.

1818 WARE, JOHN, Clifton Down, near Bristol.

1814 †WARE, MARTIN, 18, Gordon square. C. 1844-5. T. 1846. V.P. 1853.

Elected

1866 WARING, EDWARD JOHN, M.D. [Agents: Messrs. Grindlay and Co., 55, Parliament street]; 39, Portsdown gardens, Maida hill.

1861 WATERS, A. T. HOUGHTON, M.D., Physician to the Liverpool Northern Hospital, and Lecturer on Anatomy and Physiology in the Liverpool Royal Infirmary School of Medicine; 27, Hope street, Liverpool. *Trans.* 3.

1837 †WATSON, SIR THOMAS, Bart., M.D., D.C.L., F.R.S., Physician Extraordinary to H.M. the Queen; Consulting Physician to King's College Hospital; 16, Henrietta street, Cavendish square. C. 1840-1, 1852. V.P. 1845-6.

1861 WATSON, WILLIAM SPENCER, M.B., Surgeon to the Central London Ophthalmic Hospital; 27, Montague street, Russell square.

1854 WEBB, WILLIAM, M.D., Gilkin View House, Wirksworth, Derbyshire.

1840 WEBB, WILLIAM WOODHAM, M.D., Cliff House, Kirtley, South Lowestoft, Suffolk.

1842 WEBER, FREDERIC, M.D., 44, Green street, Park lane. C. 1857. V.P. 1865.

1857 WEBER, HERMANN, M.D., Physician to the German Hospital; 10, Grosvenor street, Grosvenor square. *Trans.* 6.

1835 †WEBSTER, JOHN, M.D., F.R.S., late Physician to the Scottish Hospital, and Consulting Physician to the St. George's and St. James's Dispensary; 9, Queen street, St. Andrew's. C. 1843-4. V.P. 1855-6. *Trans.* 6. *Pro.* 1.

1844 WEGG, WILLIAM, M.D., Physician to the St. George's, Hanover square, Dispensary; 26, Park lane. L. 1854-8. C. 1861-2.

1861 WELLS, JOHN SOELBERG, Professor of Ophthalmology in King's College, London, and Ophthalmic Surgeon to King's College Hospital; Assistant-Surgeon to the Royal London Ophthalmic Hospital; 16, Savile row.

Elected

1854 WELLS, THOMAS SPENCER, Surgeon in Ordinary to H.M.'s Household; Surgeon to the Samaritan Free Hospital for Women and Children; 3, Upper Grosvenor street. *Trans.* 7. *Pro.* 1.

1842 †WEST, CHARLES, M.D., Physician to the Hospital for Sick Children; 61, Wimpole street, Cavendish square. C. 1855-6. V.P. 1863. *Trans.* 2. *Sci. Com.*

1828 WHATLEY, JOHN, M.D.

1849 WHITE, JOHN.

1852 WIBLIN, JOHN, M.D., Medical Inspector of Emigrants and Recruits; Southampton. *Trans.* 1.

1844 WILDBORE, FREDERIC, 1, Trafalgar place east, [245] Hackney road.

1837 WILKS, GEORGE AUGUSTUS FREDERICK, M.D., [5, Lincoln's Inn Fields].

1863 WILKS, SAMUEL, M.D., Physician to, and Lecturer on Medicine at, Guy's Hospital; Examiner in Medicine at the University of London; 77, Grosvenor street, Grosvenor square.

1865 WILLETT, ALFRED, Assistant-Surgeon to St. Bartholomew's Hospital; 36, Wimpole street, Cavendish square.

1864 WILLETT, EDMUND SPARSHALL, M.D., Resident Physician, Wyke House, Isleworth, Middlesex.

1860 WILLIAMS, ARTHUR WYNN, M.D., Physician to the Samaritan Free Hospital; Physician-Accoucheur to the Western General Dispensary; 1, Montagu square.

1840 WILLIAMS, CHARLES JAMES BLASIUS, M.D., F.R.S., Consulting Physician to the Hospital for Consumption, Brompton; 49, Upper Brook street, Grosvenor square. C. 1849-50. V.P. 1860-1. *Sci. Com.*

1859 *WILLIAMS, CHARLES, Surgeon to the Norwich Dispensary; 9, Prince of Wales road, Norwich.

1866 WILLIAMS, CHARLES THEODORE, M.D., Assistant-Physician to the Hospital for Consumption, Brompton; 78, Park street, Grosvenor square.

1859 WILLIAMS, JOSEPH, M.D.

1868 WILLIAMS, WILLIAM RHYS, M.D., Bethlem Hospital, Lambeth road.

Elected

1829 WILLIS, ROBERT, M.D., Barnes, Surrey. L. 1838-41.

1839 †WILSON, ERASMUS, F.R.S., Consulting Surgeon to the St. Pancras Infirmary; 17, Henrietta street, Cavendish square. *Trans.* 2.

1863 WILSON, ROBERT JAMES, M.R.C.P. Edin., 24, Grand Parade, St. Leonard's-on-Sea, Sussex.

1850 *WISE, ROBERT STANTON, M.D., Consulting Physician to the Southam Eye and Ear Infirmary; Banbury, Oxfordshire.

1825 WISE, THOMAS ALEXANDER, M.D., Rostellan Castle, Rostellan, County Cork.

1841 WOOD, GEORGE LEIGHTON, Surgeon to the Bath General Hospital; 27, Queen square, Bath.

1851 WOOD, JOHN, Assistant-Surgeon to King's College Hospital, and Demonstrator of Anatomy in King's College, London; Examiner in Anatomy at the University of London; 68, Wimpole street. C. 1867-8. *Trans.* 3.

1848 WOOD, WILLIAM, M.D., Physician to St. Luke's Hospital for Lunatics; 99, Harley street, Cavendish square. C. 1867-8.

1833 †WORMALD, THOMAS, Consulting Surgeon to St. Bartholomew's Hospital; 42, Bedford row. C. 1839. V.P. 1854.

1842 WORTHINGTON, WILLIAM COLLINS, Senior Surgeon to the Lowestoft Infirmary: Lowestoft, Suffolk. *Trans.* 3.

1865 WOTTON, HENRY, Jun.

1860 WYATT, JOHN, Surgeon-Major, Coldstream Guards; Hospital, Vincent square, Westminster.

[It is particularly requested that any change of Title, Appointment, or Residence, may be communicated to the Secretaries before the 1st of October in each year, in order that the List may be made as correct as possible.]

HONORARY FELLOWS.

(Limited to Twelve.)

Elected

1853 BRODIE, SIR BENJAMIN COLLINS, Bart., M.A., F.R.S., Waynflete Professor of Chemistry at Oxford; Cowley House, Oxford.

1847 CHADWICK, EDWIN, late Commissioner of the Board of Health; Corresponding Member of the Academy of Moral and Political Sciences of the Imperial Institute of France.

1868 DARWIN, CHARLES, M.A., F.R.S., Corresponding Member of the Academies of Sciences of Berlin, Stockholm, Dresden, &c.; Down, Bromley, Kent.

1857 FARR, WILLIAM, M.D., D.C.L., F.R.S., General Register Office, Somerset House, and Southlands, Bromley, Kent.

1841 HERSCHEL, SIR JOHN FREDERICK WILLIAM, Bart., D.C.L., F.R.S., Foreign Associate of the Academy of Sciences of the Imperial Institute of France; Collingwood, near Hawkhurst, Kent.

1868 HOOKER, JOSEPH DALTON, M.D., D.C.L., LL.D., Director of the Royal Botanic Gardens, Kew; Corresponding Member of the Academy of Sciences of the Imperial Institute of France; Kew.

1868 HUXLEY, THOMAS HENRY, LL.D., Professor of Natural History in the Royal School of Mines; Hunterian Professor of Comparative Anatomy in the Royal College of Surgeons; Corresponding Member of the Academies of Sciences of St Petersburg, Berlin, Dresden, etc.; 26, Abbey place, St. John's Wood.

1868 LYELL, SIR CHARLES, Bart., D.C.L., LL.D., Corresponding Member of the Academies of Sciences of Paris, Berlin, Philadelphia, Boston, &c.; 73, Harley street, Cavendish square.

Elected

1866 MURCHISON, SIR RODERICK IMPEY, Bart., K.C.B., D.C.L., LL.D., M.A., F.R.S., Director-General of the Geological Survey; Foreign Associate of the Academy of Sciences of the Imperial Institute of France; 16, Belgrave Square.

1847 OWEN, RICHARD, D.C.L., LL.D., F.R.S., Superintendent of the Natural History Departments in the British Museum; Foreign Associate of the Academy of Sciences of the Imperial Institute of France; Sheen Lodge, Mortlake.

1825 SEDGWICK, The Rev. ADAM, A.M., D.C.L., LL.D., F.R.S., Woodwardian Professor of Geology, Cambridge.

1868 TYNDALL, JOHN, LL.D., Professor of Natural Philosophy in the Royal Institution, and in the Royal School of Mines; Corresponding Member of the Academies and Societies of Sciences of Göttingen, Haarlem, Geneva, &c.; Royal Institution, Albemarle street, Piccadilly.

FOREIGN HONORARY FELLOWS.

(Limited to Twenty.)

Elected

1841 ANDRAL, G., M.D., Member of the Institute and of the Imperial Academy of Medicine; Physician in Ordinary to the Emperor of the French; Paris.

1862 CRUVEILHIER, JEAN, M.D., Physician to the "Hôpital de la Charité;" Member of the Imperial Academy of Medicine; Paris.

1864 DONDERS, FRANZ CORNELIUS, M.D., Professor of Physiology and Ophthalmology at the University of Utrecht.

1856 DUBOIS, BARON PAUL, Commander of the Legion of Honour; Member of the Imperial Academy of Medicine; late Dean of the Faculty of Medicine; Paris.

1835 EKSTRÖMER, CARL JOHAN, M.D., C.M., K.P.S., and W., Physician to the King of Sweden; President of the College of Health, and Director-General of Hospitals; Stockholm.

1841 EHRENBERG, CHRISTIAN GOTTFRIED, Foreign Associate of the Academy of Sciences of the Imperial Institute of France; Berlin.

1868 GROSS, SAMUEL D., M.D., F.R.C.P. Philad., Professor of Surgery in the Jefferson Medical College of Philadelphia.

1866 HANNOVER, ADOLPH, M.D., Professor at Copenhagen.

1859 HENLE, J., M.D., Professor of Anatomy at Göttingen.

1868 KÖLLIKER, ALBERT, Professor of Anatomy at Würzburg.

1856 LANGENBECK, BERNHARD, M.D., Professor of Surgery in the University of Berlin.

1868 LARREY, HIPPOLYTE BARON, Member of the Institute; Inspector of the "Service de Santé Militaire," and Member of the "Conseil de Santé des Armées;" Surgeon-in-Ordinary to the Emperor; Commander of the Legion of Honour, &c.; Rue de Lille, 91, Paris.

Elected

1843 LIEBIG, BARON JUSTUS von, M.D., Conservator of the Royal Collection, and Professor of Chemistry, in the University of Munich; Foreign Associate of the Academy of Sciences of the Imperial Institute of France; Munich.

1841 LOUIS, P. C. A., M.D., Honorary Physician to the Hotel-Dieu; Member of the Imperial Academy of Medicine; Paris.

1868 NÉLATON, AUGUSTE, Member of the Institute, and of the Imperial Academy of Medicine; Surgeon to the Emperor; Member of the Senate; late Professor of Clinical Surgery to the Faculty of Medicine; 1, Avenue d'Antin, Paris.

1862 PIROGOFF, NIKOLAUS, M.D., Professor of Surgery to the Medico-Chirurgical Academy in St. Petersburg, and Director of the Anatomical Institute; Consulting Physician to the Hospitals Obuchow, Peter-Paul, and Maria Magdalena; St. Petersburg.

1850 ROKITANSKY, CARL, M.D., Curator of the Imperial Pathological Museum, and Professor of the University of Vienna. Referee for Medical and University Education to the Austrian Ministry; Vienna.

1856 STROMEYER, LOUIS, M.D., Director-General of the Medical Department of the Army of Hanover; Hanover.

1856 VIRCHOW, RUDOLPH, M.D., Professor of Pathological Anatomy in the University of Berlin; Corresponding Member of the Academy of Sciences of the Imperial Institute of France; Berlin.

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ON

EXCISION OF THE LARGER JOINTS;

WITH A TABLE OF CASES.

BY

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Received Sept. 9th.—Read Nov. 10th, 1868.

THE success of the operation of excision of the knee, introduced by Sir Wm. Fergusson in 1850, naturally led to a reconsideration of the subject of resection as applied to other joints. Up to that time cases of disease of the hip involving destruction of the cartilages were treated with counter-irritation and rest, in the hope that anchylosis would in time take place. When this did not occur the surgeon had no other resource, and the history of the cases was but too often recorded in the specimens with which our museums abound. Under certain exceptional circumstances, indeed, surgical operation was had recourse to, but this could not be said to form any part of the recognised mode of treating disease of the hip-joint. The great authority upon diseases of the joints, at the period to which I allude, says, "In an old case of diseased hip-joint the head of the femur may sometimes be felt lying on the dorsum of the ilium, and, in consequence of the general emaciation of the patient and the wasting of the muscles, with so little soft parts over it that it seems to be almost immediately beneath the common integuments.

In such a case it has been proposed to make an incision on it and remove the head and neck of the femur by a saw. It would appear that this operation has been actually performed with some degree of advantage, and I do not doubt that circumstances may occur to make it worth while to have recourse to it. But it is to be observed, at the same time, that all that can be thus accomplished is the removal of one portion of the disease, and that it is the largest portion of it, in the bone of the pelvis, which is necessarily allowed to remain. The operation cannot be performed without a certain degree of local disturbance, and more or less of loss of blood; and taking all those things into consideration, I conceive that we should not recommend it except where some very unequivocal advantage may be expected from it."[1]

Now, it is evident from this passage that very few surgeons, previous to the period I have mentioned, thought of excision as a means of treating disease of the hip-joint, and that still fewer ever practised it. The instances that occurred in which anchylosis could not take place, as was generally the case when the disease involved a portion of dead bone, were, as a rule, confined to bed for the remainder of their days.

In similar cases of disease of the knee-joint the surgeon had a resource in amputation—a severe measure, involving the loss of the leg and knee, and not unattended with danger—a measure so severe that it was often delayed until the constitution of the patient was irretrievably damaged.

It became, then, a question of the highest surgical interest to know whether the excision of a joint is, as a rule, more or less dangerous than amputation, and whether the limb that was left after such an operation is more adapted to the patient's wants than some mechanical contrivance would be.

The principal object of this paper is to add the cases which have fallen under my own care to those which have been recorded by other surgeons, in the hope that they may tend to the solution of these most interesting questions, and may be the means of pointing out the conditions under which resection is preferable to amputation.

[1] Sir B. Brodie's works, p. 210.

With regard to the cases of disease of the knee-joint, it must be premised that in no case was resection of the joint proposed where it was thought that there was any chance of preserving a limb which would ever be of use to the patient. It is true that on some occasions there is less objection to resection on the part of the patients, or their relatives, than to amputation, and therefore the former operation may sometimes be done at an earlier period than the latter. This, no doubt, may be a circumstance which tells in statistical tables in favour of excision, but it is one of the advantages incident to the mode of treatment; any numerical comparison with regard to the treatment of diseased joints by excision should therefore be drawn between excision and amputation, and not between excision and any other mode of treatment.

TABLE I.—*Three cases of excision of the head of the femur.*

No.	Name.	Age.	Date of Operation.	Observations.
1	Henry Cresswell	14	July 6, 1865	Left the hospital at expiration of seventy days. The pelvis was somewhat twisted. Limb two inches shorter than the other; still slight discharge from wound. Has not been heard of since.
2	Edward Disney	8	Jan. 18, 1866	Discharged from hospital July 4th, 1866. The head of the bone and the great trochanter were both much diseased in this case. The neck of the femur contained a portion of dead bone. The portions of bone removed were placed in maceration, but crumbled away in great measure in the process. The head of the bone is, however, partially preserved. This patient recovered with a perfectly useful and movable joint. In the summer of 1868 he walked from Whitechapel to London Bridge, and from Hungerford Market to St. George's Hospital, to show himself, and seemed to think nothing of having to walk the same distances home again.
3	Eliza Castle	14	June 6, 1867	In this case the acetabulum was diseased as well as the head of the femur. Portions of the carious acetabulum were removed at the time of the operation. The head of the femur was carious, and the cartilage that remained was almost entirely detached from it. The neck of the femur contained a small portion of necrosed and separated bone. On the 29th of July a small piece of bone came away, and on the 6th of November she was sent to Margate; some other very small pieces of bone came away during the summer of 1868. In August of the same year a very small sinus was left. She experienced no pain or inconvenience, but could not bear her whole weight on the limb. The limb was two inches shorter than the other, but the heel of the affected side came fairly to the ground, the difference of length between the two legs being compensated by a twist in the pelvis.

TABLE II.—*Twelve cases of excision of the knee.*

4	Harriet Audrie	7	June 30, 1860	This patient was in St. George's, Ormond Street, and King's College Hospitals. There was some necrosed bone in the head of the tibia. In October the wound made by the operation was nearly healed, and on the 3rd of November she was discharged from the hospital. The last note of the case says, "The leg was of good length compared with the other."
5	Benjamin Bennet	8	April 23, 1863	An abscess was found in the internal condyle of the femur. Left the hospital July 1st, 1863. The wound was then quite healed, and the bones anchylosed. He came to the hospital to show himself on the 22nd December, 1863. He could then walk and run with facility. The leg was about an inch shorter than the opposite one.
6	Patrick Rhyle	24	Nov. 24, 1864	Abscess and necrosed bone in head of tibia. Left the hospital March 1st, 1865. Could walk with crutches; a severe attack of rheumatism delayed his recovery.
7	Charles New	11	Dec. 14, 1865	Operation for strumous disease. Discharged May 22nd, 1866. Firm union; limb nearly two inches shorter than the other.
8	Henry Newton	13	Jan. 18, 1866	Periostitis of lower end of femur, causing great swelling; abscess in joint. Discharged July 11th, 1866.
9	Richard Pratt	15	Aug. 30, 1866	Old abscesses; dislocation and anchylosis of knee; wound affected with phagedæna October 1st. Discharged March 11th, 1867. Wound almost healed; got about well with the assistance of crutches.
10	Edward Kemmins	7	March 14, 1867	Strumous abscess in knee-joint. Immediate relief of pain by operation; no constitutional disturbance and very little local action followed operation. Sent to Margate May 16th. Readmitted with very movable joint in 1868, when the soft fibrous tissues between the ends of the bone were removed by operation without producing any constitutional disturbance.

No.	Name.	Age.	Date of Operation.	Observations.
11	William Chapman	21	April 4, 1867	Strumous disease of knee. Died April 24th. The extremities of the bones were found softened. The cancellous structure of the femur in a state of diffuse osteo-myelitis. The femoral vein contained some broken-down coagula, but the lining membrane was quite smooth. There were incipient secondary deposits in the right lung. The liver was fatty, the spleen pulpy, and the kidneys congested.
12	Luther Watson	4	May 15, 1867	Abscess in lower extremity of femur, communicating with knee-joint. Discharged October 19th.
13	Anthony Bachelor	9	June 6, 1867	Strumous disease. Discharged October 2nd, 1867. Wound healed; union firm; limb 1½ inch shorter than the opposite one.
14	Stephen Ring	12	Dec. 14, 1867	Strumous disease; abscess of femur opening into knee-joint. The knee had been bent at an acute angle since he was two years of age. A letter from the boy's father mentions that at that time Professor Syme said, "it would be far better to have it taken off." The limb had never been developed. Some years ago he had an accident and broke the femur, which was allowed to unite with the ends overlapping, and at an angle. The wound made in the excision healed in great part by first intention. He was discharged January 17th, 1868. A small sequestrum of bone was removed from the anterior edge of the tibia in June, 1868. Both before and after this he could walk firmly and without assistance by means of a peg attached to the bottom of a lace-boot. Shortening from the various causes mentioned, 5½ inches.
15	Caroline Blakely	5	Aug. 27, 1868	Contracted and partial dislocation of the knee. Strumous disease of ends of bone; ulceration of cartilages. Died September 12th. Purulent infiltration of the remains of the epiphyses and also of the shafts of the tibia and femur; old scrofulous deposit in lung; minute tubercular deposits in the fissure of Sylvius on each side at the base of the brain.

TABLE III.—*One case of excision of the shoulder.*

16	Wm. Frampton	26	July 26, 1866	Extensive caries of head of humerus, with abscess in joint, and sinuses leading externally. Discharged October 11th, 1866. Had considerable motion of joint; a sinus still discharged.

TABLE IV.—*Four cases of excision of the elbow.*

17	Kate Wood	15	Aug. 27, 1863	Strumous disease. The extremities of the humerus, radius and ulna, were removed; some small pieces of bone subsequently exfoliated; regained excellent use of her arm; when her sleeve was down a stranger would not know that anything had been done. Last seen with very perfect use of her arm in June, 1868.
18	Thomas Offer	13	Sep. 20, 1864	Primary excision; accident caused by the bursting of a gun; very favorable recovery; free flexion and extension November 9th, 1864.
19	Walter Walder	36	Aug. 17, 1864	Abscess in joint following injury; the wound was healed November 30th, when he was discharged; could flex and extend the limb; a sinus subsequently formed, through which some exposed bone could be felt.
20	Emily Duffin	20	June 7, 1866	Abscess in joint; anchylosed in nearly a straight position; made apparently a good recovery, but subsequently attacked with most severe and long-continued pain in the humerus. After a long delay, and when it appeared that she was becoming exhausted, the arm was, with much reluctance, amputated; very perfect fibrous union had taken place in the joint. A small piece of detached separated dead bone was found in the ulna, and a considerable quantity of new bone was found deposited on the surface of both the ulna and humerus.

TABLE V.—*Two cases of excision of the wrist.*

No.	Name.	Age.	Date of Operation.	Observations.
21	John Dare	23	March 5, 1860	Discharged June 20th, 1860. The tendons about the back of the wrist were so involved in the general thickening that it was thought impossible that their motion could be restored. The bones were therefore removed by a transverse incision; some power of extending the fingers, however, remained after the operation. This probably depended upon the interossei and lumbricales.
22	Eliza Messenger	44	July 30, 1868	Left the hospital August 13th on account of some family business. In this case the bones of the carpus and some of the bones of the metacarpus were necrosed. The necrosed bones only were removed. No hopes were entertained of regaining the power of moving the fingers, but the patient preferred this operation to amputation. No constitutional symptoms followed the operation.

This table does not include two cases in which an operation was commenced as if for resection, and completed by immediate amputation. The bones in these two cases were known to be extensively diseased, and the operation was undertaken with the understanding that, if the disease extended beyond the limits which would justify resection, amputation should be performed. One of these was a case of old disease of the hip, with an abscess in the joint extending through the acetabulum half way to the umbilicus. The other was an instance of abscess in the knee-joint in which the tibia proved to be extensively involved. Both these cases recovered in a very satisfactory manner.

In two of the above cases mentioned under Section I (Excision of the Head of the Femur) the head of the bone was dislocated from the acetabulum. In the third case, and also in that in which amputation was performed, the head of the bone was in its natural position. In none of the cases was there any inconvenient amount of hæmorrhage. In the third case distinct crepitus could be felt on moving the joint before the patient experienced any great amount of pain. Previous to the operation, however, the pain became exceedingly severe. This led to the idea, after it was found that the cartilage was in a great measure detached from the head of the femur, that the pain had resulted, not from simple ulceration of the cartilage, which must have occurred before the crepitus would have been felt, but from the slight attachment of the cartilage to the layer of bone beneath. When the cartilage is thus in great measure detached it may easily be conceived how a very slight motion would tend to detach it farther and how much pain this would occasion. This case is the first, as far as I know, in which resection of the head of the femur has been performed where there has been no abscess in the joint and no external opening. The immediate cessation of the suffering of the patient appeared amply to justify the operation, and the existence of a portion of dead bone in the neck of the femur showed that she could not have recovered by any other means. The subsequent history of the case proves that excision of the head of

the thigh bone may afford the opportunity for necrosed portions of a diseased acetabulum to escape, which otherwise would remain permanently locked up, so that, although the whole of the disease as regards the acetabulum may not be removed at the time, the patient has a better chance of recovery even with regard to this part of the disease than without an operation.

In performing the operation of resection of the head of the thigh bone, when that is not dislocated, it is not sufficient to divide the capsular ligament in a circular direction. If this only is done, as may be proved by operating upon the dead subject, there may be considerable difficulty in getting the head of the bone out of its socket. The plan which I have adopted is first to make a longitudinal incision parallel to the neck of the femur and extending through its whole length. The knife may then be introduced between the neck of the bone and the capsule. This may easily be divided in front and behind the bone, so as to leave in it a crucial incision, and the head of the bone may then easily be dislocated.

The operation of excision of the knee-joint differs from similar operations on other joints, inasmuch as it may in young subjects be performed without injury to the shafts of the bones. The excisions may be carried through the epiphyses, and then round bones, and not long bones, physiologically speaking, are alone involved in the operation. This is a point to which I am inclined to attach considerable importance. In the great majority of cases of ordinary amputations and fractures that have fallen under my care, and which have terminated unfavorably, there has been inflammation of the cancellous structure of the bone terminating in purulent absorption, erysipelas, or some analogous disease. It must be obvious that if the cancellous structure of the long bones of a limb are uninjured in an operation, the chances of any such diseases occurring are very much diminished. An opportunity was offered me some time ago of seeing some of the preparations of Mr. Jones, of Jersey. I was struck with the small amount of bone removed in some of his cases of excision of the knee-joint, and I cannot help associating in

some degree the success which attended his operations with this circumstance. In several of the cases included in the table the cancellous structure of the bone had been consolidated by chronic inflammation, produced either by the presence of portions of dead bone or by chronic abscesses in the extremities of the bones. This consolidation of the cancellous structure is another safeguard against purulent infiltration of the tissues of the bone, and to the two causes now mentioned I am inclined to attribute the large proportion of recoveries in the cases which have fallen under my care.

To Sir Wm. Fergusson is undoubtedly due the sole credit of having suggested resection of the knee-joint as a mode of treatment, for although it had been performed many years ago, it had never until his day been proposed as an ordinary plan of treating diseases of the knee for which an operation was the only remedy. Having been connected with King's College Hospital at the time that Sir William Fergusson performed his first operation, I know well the amount of opposition which the plan of treatment encountered, and how little the majority of surgeons expected that it would succeed.

One case of excision of the elbow (No. 20) was followed after some lapse of time by amputation of the arm; very perfect fibrous anchylosis had, however, taken place, and the amputation was performed for an affection of the shaft of the bone of the arm, and not for any disease in the joint. In another case (No. 17) of excision of the elbow a crude tubercle was found in the extremity of the humerus. This disease was described by Sir Benjamin Brodie, who has left some very beautiful drawings in illustration of it. It has, however, very seldom been mentioned by other surgeons as having been seen in post-mortem examinations.

The records of the Medical Society of Observation, instituted some years ago for the purpose of making a return of the results of different operations in the various London hospitals, furnish a list of 186 amputations from all causes. Of these, 69 died. Out of this number there were 10 in which amputation was performed for chronic disease of the

knee in patients of sixteen years of age and under. Of these, one died at the end of thirty days, the other on the eleventh day. The numbers given here are not large, but may, perhaps, be taken as the average mortality after amputations in London hospitals, and with these the results of resection of joints in the foregoing table may be favorably compared. Out of 22 cases of excision of the larger joints, 2 only terminated fatally.

THE RESULTS IN THIRTY-NINE CASES OF EXCISION OF THE KNEE.

BY

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Received Oct. 14th.—Read Nov. 10th, 1868.

THE following may be regarded as supplementary to a paper communicated by me to this Society and published in Vol. XLI of its 'Transactions.' The first thirteen of the cases are related there, and observations are offered respecting the cases most suited to the operation, &c., to which I will merely refer inasmuch as they have been, in almost every particular, fully confirmed by my subsequent experience.

In 39 cases in which I have performed the operation of excision of the knee, the result has been as follows:

28 recovered. 2 died. 9 underwent amputation; of these 5 recovered and 4 died.[1]

All the cases were treated in Addenbrooke's Hospital.

[1] Since this paper was read I have performed the operation six times; five of the patients have recovered, and one is under treatment. This makes the number of operations 45, and the number of recoveries 33.—*July*, 1869.

Of the two patients who died without amputation, one (No. 8) was the girl, æt. 5, whose case is related at p. 203 of the volume just referred to. The operation was performed, perhaps rather unwisely, on account of acute suppuration in the joint, supervening upon chronic disease with an opening into the joint, and attended with violent fever. The condition was most unfavorable for any operation, and the child would probably have died whatever course was taken. In the other (a female, æt. 25, No. 31) death was caused by a violent attack of hæmatemesis commencing a few days after the operation, and having, apparently, no particular relation to it.

Of the four who died after amputation the excision was in one (No. 29) performed in consequence of an extensive contused wound of the thigh, caused by a wheel passing over it, laying open the knee-joint and admitting a quantity of gravel and dirt into it. The lad was restless and delirious after the operation, with slight discharge from the wound, but there was no swelling or other indication of inflammation. As he became worse, I amputated on the fourth day. The restlessness continued, mortification of the stump supervened, and he died three days after the amputation.

In the other three cases amputation was performed in consequence of continued suppuration undermining the health, and was, in each instance, delayed too long.

In the remaining five cases in which amputation was performed, the reason for the removal of the limb was the same as in the three last mentioned. In one case, at least, I thought the extensive and continued suppuration was caused by bleeding taking place into the wound after the patient was replaced in bed, and I have accordingly been very careful in the later cases to prevent this occurrence by securing all the vessels that were at all likely to bleed. In two, if not three, of the cases I judged, from examination of the part after amputation, that the limb might have been saved if I had made incisions in the course of the discharging sinuses, so as to expose or remove the carious edges of the bones.

In each of the cases of recovery the cut surfaces of

the tibia and femur united together, and a good, firm, sound limb was gained. In four, in consequence either of an accident or of the patient's bearing upon the limb before firm union of the bones had taken place, the part became more bent than is desirable; in one of these (No. 15) I subsequently straightened the limb by removing a V-shaped piece from the forepart of the angle, and the patient has now, I am told, a straight limb, and can walk well. The other three are too satisfied with their condition to assent to any further operation. One, with the aid of a wood and iron addition to his limb, says "he can walk and work with most of them." Another considers the flexure rather advantageous, and says he can walk and work as well as other people. The third patient also can walk and work very fairly.

Through the kindness of medical men, and in other ways, I have been able to obtain information respecting the condition of most of the patients at various periods since the operation, and the result is highly satisfactory. The limb is, of course, stiff at the knee, but there is no other inconvenience. The slight shortening caused by the removal of the articular surfaces is no disadvantage. On the contrary, it facilitates the swing of the foot forwards in walking and running. There has been no tendency to return of disease at the part in any that I have heard of.

In the majority of the cases the disease in consequence of which the operation was performed had commenced in the synovial membrane, and had made its way slowly through the cartilages, more or less deeply, into the bones, so as to leave little or no prospect of a useful joint or of the limb being preserved.

In some the disease had passed away and sinuses resulting from an ulcerated state of the bones had healed, but the joint was contracted and the articular surfaces were distorted beyond the hope of benefit from extension and mechanical appliance. In these two classes of cases, and in some others, excision offers the prospect of a very useful limb, a better prospect, so far as my experience goes, than does any other

procedure, and it does so with little risk. I say with little risk, because the operation, though extensive, is, as in the case of other operations in which osseous structures are chiefly concerned, not usually followed by much constitutional disturbance. No large vessels or nerves, and not much muscular tissue, are involved. The chief danger to be feared is a continuance of suppuration undermining the health and rendering amputation necessary. This may probably be lessened by improved treatment after the operation. It is most likely to occur in patients of strumous temperament. In such persons, as mentioned in my former paper, disease lingers long in the synovial membrane, causing thickening and other changes in it, and tedious suppuration is not unlikely to follow excision. This was the most frequent cause of failure in my cases.

There is no longer any doubt that the growth of a limb after excision of the knee, in a young subject, may keep pace with that of the opposite limb, provided the epiphysial or growing lines at the end of the femur and the tibia have not been removed or injured, and provided other circumstances are favorable. This is shown by Case 30 and others. Nevertheless, just as growth is commonly more or less impaired when muscular action in a limb is prevented by paralysis, by disease, or anchylosis of a joint, so some years after excision it is not unfrequently found that the limb is shorter than its fellow, to an amount which is scarcely to be accounted for by the loss of bone incurred in the operation. Thus, in Case 13, ten years after the operation, performed at the age of thirteen, the operated femur measured sixteen inches and the tibia fourteen; these bones in the opposite limb measuring respectively eighteen inches and fourteen and a half. The operated tibia had grown as fast as the other; but, for some reason not quite obvious, the operated femur had been less active in its growth than its uninjured compeer. In Case 22, six years after the operation, performed at the age of fourteen, the femur and tibia were each two inches shorter in the operated than in the other limb. In Case 15, three years after the operation, performed at the

age of ten, the operated femur measured thirteen inches and the tibia ten and three quarters; in the opposite limb the femur measured fourteen inches and the tibia eleven and three quarters. It may be remarked that in each of these cases the limb had become bent after the operation, and it is quite probable that anchylosis of the two bones in this position may be more unfavorable to their growth than if they had remained straight.

It is, however, important to observe that the limb, whether it remained short or grew in conformity with the other, whether it continued straight or became bent, was in every instance a very useful limb; and it was so because all disease had been cleared away. The weakness associated with disease and impaired structure was gone, and a firm sound limb attained, such as it can rarely become so long as the altered articular surfaces remain. It is upon this complete removal of the morbid and weakened tissues and the union of the clean cut osseous surfaces of the bones, forming a solid weight-bearing column, that the advantages of excision of such a joint as the knee mainly depend.

The operation of excision of the knee recommends itself, therefore, partly at least, on the following grounds. When disease has proceeded to such an extent as seriously to alter or destroy the synovial, cartilaginous, or osseous structures of the joint (which, be it observed, commonly may, and in the upper class of society usually is, prevented by early attention and rest), it is almost in vain to expect that a useful joint can be restored, by which I mean a joint with useful movement and able to bear the weight of the body well. Indeed, the limited movement which remains is, commonly, worse than useless; it is mischievous, by entailing weakness, with liability to return of disease, and permitting contraction to ensue. The best result that can take place in such a case is the complete abolition of the joint with anchylosis of the bones. Even if the limb be bent or otherwise distorted, it is more likely to be useful when anchylosed than if movement continued. Unfortunately, as we know, this result does not very often take place at the knee. As the disease subsides

the articular surfaces become united, and that, perhaps, in parts only, by a soft fibrous medium, which permits some movement, and has little disposition to ossification even under the long-continued favorable condition of perfect rest. In most of the limbs rendered crippled, useless, and wasted by disease of the knee, some movement of the joint remains, insufficient for any useful purpose, but enough to disable the limb from bearing weight; and mechanical supplements, even if they answer their purpose, are by most persons unattainable. By excision this difficulty is overcome, the remaining portions of the joint, which serve only to render the limb useless, are removed, and anchylosis of the bones is effected. In short, we bring about by the operation that condition which we would gladly see attained without such interference.

I usually commence the operation by a semilunar incision, with the convexity downwards in front of the knee, then reflect the skin a little, cut into the joint, remove the patella and as much of the diseased synovial membrane as I can, expose the articular surfaces, and saw off the diseased parts.

It is sometimes necessary to saw off a second or a third slice, or to gouge out ulcerated or diseased portions; and it is better to apply the saw two or three times than to remove recklessly large portions at first, though this may have the trifling advantage of expediting the procedure. I do not reflect the circa-periosteal tissues close, but prefer to saw them off with the bones, so as to leave the latter well covered at their edges, and therefore less liable to ulcerate. It is also very important so to saw the bones that when the cut surfaces of the tibia and femur are placed in contact they fit well to each other, the line of the limb being straight, *i. e.* not bent or with the leg inclined to either side.

I am very careful to sponge the wound well and secure the bleeding vessels, so as to prevent hæmorrhage taking place after the patient is placed in bed, for the collection of blood in the wound prevents early union and entails suppuration. Ligatures should, if possible, be avoided, and torsion used instead, so that no foreign body is left in the wound.

Having taken these precautions and placed the cut surfaces of the bones in as complete apposition as possible, I bandage the limb along its whole length, except in the line of the wound, upon a splint placed behind and provided with a foot-piece. I then unite the edges of the wound by sutures and apply long splints on the sides, with pads placed above and below the knee, so as to defend the operated part from undue pressure, and to permit discharge to escape in the event of suppuration taking place. The limb is thus firmly secured in its whole length, except at the wound, which is left exposed. The bandages are moistened with blood, which sets and affords additional security. I am very particular to adjust things well and firmly in the first instance, and am very unwilling to disturb the limb afterwards. Indeed, I frequently do not remove any of the bandages or splints for five, six, or more weeks; and by this care and perfect quiet I endeavour to promote immediate union, which, not uncommonly, takes place throughout the entire wound. If this fails to take place and suppuration ensues, I still do not remove or change the bandages and splints, unless there is some unusual reason for doing so, but allow the discharge to escape at the sides and adopt various means to maintain cleanliness. This perfect quietude and abstinence from removal of the bandages first applied is, I consider, a very important item in the treatment. It is equally important not to discontinue the splints till the bones are quite firmly united, till the patient can raise the limb from the bed by its own muscles, without any movement being perceptible between the tibia and femur. It is necessary to make quite sure of this. For that purpose I watch closely when the effort to raise the limb from the bed is first made, because any slight movement is then most easily detected; and if the patient is allowed to get up while movement, however slight, takes place between the bones, the part is liable to become bent, or the process of anchylosis may be suspended, and the good result is thus marred. This flexure, as already stated, took place in some of my cases. It, as well as failure of firm union between the bones, has occurred in the practice of

others; but they may be always, or generally, avoided by attention to the directions I have given.

The cancellous parts of bones, whether broken or cut, commonly unite well and quickly, and the opposed surfaces of the tibia and femur, after excision of the knee, form no exception to this rule. I have often been surprised at the rapidity with which the wound healed and the bones grew together.

When suppuration takes place and continues, careful management is required, for which it is impossible to lay down rules. Much judgment also is needed in deciding on the propriety of laying open sinuses and exposing or removing carious bone, and still more in determining the period beyond which it is unsafe to defer the removal of the limb. The result proved in some of my cases that I had delayed this too long; and in others the examination of the part after amputation indicated that, with additional patience and well-directed incisions, the limb might have been spared.

Excision of the knee is an operation requiring care in the execution, and care and patience in the subsequent management; but it is not an operation of much danger, and by it, I am sure, many an amputation might be avoided and many crippled, worse than useless, limbs, such as we daily see carried about our streets, might be rendered good helpmates to their fellows.

Table of thirty-nine cases of excision of the knee.

No.	Name.	Age.	Date.	Nature of disease.	Result.
1	Eliza H—	20	Oct., 1854	Synovial, extending to bones, 6 years	Recovered walks well, March, 1858.
2	Edward W—	47	April, 1855	Ununited patella, rendering limb useless	Recovered, walks well, August, 1858.
3	William C—	12	June, 1855	Joint mutilated, bent, and useless from disease; extension failed	Recovered, walks well, January, 1858.
4	John C—	20	July, 1856	Severe progressing disease, 3 years, health indifferent	Amputation, November, 1856, recovered.
5	Thomas H—	29	July, 1866	Synovial, extending to bone, 3 years, health failing	Recovered, walks well, July, 1857.
6	Harriet S—	23	March, 1857	Synovial, extending to bones, 7 years, health failing	Amputation, January, 1858; recovered of other complaint December, 1867.
7	Charles L—	10	April, 1857	Synovial, extensive, with abscesses, health bad	Amputation, July, 1857, recovered.
8	Amy E—	5	May, 1857	Acute suppurative synovitis, high fever	Died.
9	Wm. K—	25	May, 1857	Synovial, ulceration of bones, 3 years	Recovered, walks well, March, 1868.
10	Samuel B—	35	May, 1857	Synovial, ulceration of bones, 3 years	Amputation, August, 1857, recovered.
11	Eliz. M—	18	July, 1857	Synovial, ulceration of bones, 7 years	Recovered, walks well, April, 1859.
12	Sarah D—	21	Oct., 1857	Synovial, cartilages destroyed, 7 years	Recovered, walks well, July, 1858.
13	Henry S—	13	Jan., 1858	Synovial, ulceration of bones, 1 year	Recovered, walks well, October, 1858.

No.	Name.	Age.	Date.	Nature of disease.	Result.
14	Thomas S—	25	May, 1858	Synovial, ulceration and necrosis of bones, 4 years	Amputation, August, 1858, recovered.
15	Lavinia W—	10	July, 1858	Contracted joint, anchylosed patella, 8 years; extension failed; again contracted after injury; second operation October, 1861	Recovered, walks well, 1867.
16	Reuben D—	16	August, 1858	Synovial, ulcerated bones, 2½ years	Recovered, walks well, June, 1860.
17	Phœbe H—	16	April, 1859	Synovial, ulcerated cartilages and bones, 1 year	Recovered, walked well, subsequently died of phthisis.
18	John P—	40	May, 1860	Synovial, 5½ years	Amputation ten days after, died.
19	Thomas H—	21	April, 1861	Ulceration of bones, extensive, 14 years	Recovered, walks well, can carry heavy weights, October, 1862.
20	Eliza C—	15	Dec., 1861	Scrofulous disease, synovial membrane, bones, long duration	Recovered, walks well, July, 1868.
21	Mary W—	35	May, 1862	Ulceration of bones, 4 years	Recovered, walks well.
22	David R—	14	July, 1862	Contracted, distorted, altered articular surfaces	Recovered.
23	Stephen T—	29	Aug., 1862	Ulcerated bones, sinuses, 3 years	Recovered, can walk and run well, April, 1868.
24	James G—	6	Aug., 1862	Synovial, ulcerated bones, sinuses, long standing, ill health	Amputation, died.
25	Robert S—	40	Sept., 1862	Synovial, ulcerated bones, 2 years, health failed	Amputation, died.
26	Matilda F—	22	March, 1863	Synovial, ulcerated bones, 12 years	Recovered, walk well, April, 1864.
27	Eliza R—	12	Dec., 1863	Synovial, contracted, ulcerated bones, 2 years; extension failed	Recovered, good straight and strong limb, July, 1868.

28	Moses S—	36	Jan., 1864	Synovial, polypose, diseased cartilages, 13 years	Recovered, walked well.
29	Lad	...	Feb., 1864	Contused wound, gravel in joint	Amputated, died.
30	Dinah B—	8	June, 1864	Deformed knee from disease	Recovered, walks well, very little shortening, July, 1868.
31	Mary J—	25	July, 1864	Distorted, useless, long standing	Died from hæmatemesis.
32	Maud J—	8	July, 1864	Synovial, extensive ulceration of bones, 1½ year	Recovered.
33	Mary Ann P—	20	April, 1865	Synovial, scrofulous ulceration of bones	Recovered, since dead of phthisis.
34	Fred. W. F—	9	Dec., 1865	Scrofulous disease, synovial membrane and bones	Recovered.
35	David M—	38	May, 1866	Joint crippled from past disease	Recovered.
36	John P—	22	April, 1867	Synovial, ulceration of bones, unhealthy	Recovered, good limb, July, 1868.
37	Mary A. J—	14	Jan., 1868	Synovial, altered form of articular surfaces, contraction	Recovered, walks well, July, 1868.
38	Sarah B—	40	April, 1868	Synovial, ulcerated bones	Recovered.
39	Joseph L—	24	May, 1862	Synovial, deep ulceration of bones, long standing	Recovered, walks well, September, 1868.
40	George J—	37	Nov., 1868	Wound in knee, severe suppuration	Recovered, walks well.
41	Wm. S—	17	Feb., 1869	Disease of femur, ankylosed patella	Recovered.
42	Alfred M—	32	April, 1869	Growths from synovial membrane	Recovered.
43	James J—	8	May, 1869	Diseased synovial membrane and bones	Recovered.
44	Anne J—	22	April, 1869	Knee bent and crippled from past disease. Limb short and useless	Recovered.
45	Thirza A—	13	May, 1869	Diseased synovial membrane	Under treatment.

4. The amputation was performed in consequence of continuing suppuration, causing the health to fail. Portions of synovial membrane remained, and there was an absence of osseous union between the bones.

6. There was firm bony union; sinuses led down to carious bone. I advised the laying open these and removal of diseased bone, and regretted that this had not been tried, believing that the limb might have been saved.

7. Abscesses continued and health failed. Fibrous union of bones, no caries.

10. Was of restless irritable temperament and health failed, though there was nothing in limb to forbid recovery.

13. July, 1868.—The knee is bent, which he considers rather an advantage. The right femur measures sixteen inches, the left eighteen. The right tibia measures fourteen inches, the left fourteen and a half.

14. A good deal of bleeding after the operation into the wound, causing suppuration, was, I thought, one cause of this case doing badly. The bones were united by fibrous structure, edges carious. Free incisions and removal of carious edges might, probably, have saved this limb.

15. Before firm union had taken place she hurt the limb. It became bent, so that she went lame, and I accordingly performed the operation a second time, October, 1861.

22. Was beginning to walk well upon the limb when he was thrown from a horse and the limb bent under him. It remained bent, and is now, July, 1868, bent at an angle of about 100°. The bones are firmly united, but the tibia and femur are each two inches shorter than in the other leg. He walks upon the limb, though lamely.

24. Suppuration went on, weakening the child. Amputation delayed too long.

25. Profuse suppuration, lowering the man, so that he sank after amputation, which was delayed too long.

29. The tissues about the joint lacerated, contused, and ingrained with gravel from wheel of loaded waggon passing over; restless, delirious; dirty discharge. Amputation on fourth day. Continued restlessness till death.

31. Was going on well when violent hæmatemesis occurred and proved fatal. She had long been subject to flatulence and pain after food.

ON CERTAIN POINTS

IN THE

PHYSIOLOGY AND PATHOLOGY

OF THE

FIFTH PAIR OF CEREBRAL NERVES.

BY

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Received Sept. 24th.—Read Nov. 24th, 1868.

The knowledge which we at present possess respecting the functions of the cerebral nerves is mainly derived from two sources, viz. from the results of vivisections in animals, and from pathological cases in which the energy of one or more of these nerves had been impaired during life. By combining the two series of observations, and correcting the one with the aid of the other, it has been possible to establish, on the whole, pretty accurate notions on this matter; and no diversity of opinion can now be said to exist amongst physiologists and physicians about the functions of the majority of the nerves in question. In fact, the only two cerebral nerves the physiology of which still remains in an unsettled condition are the pneumogastric and the fifth.

That so much uncertainty should still exist concerning the functions of these two important pairs of nerves is easily accounted for by their being endowed with far more complex

functions than the rest of their fellows, which either preside over the organs of special sense or impart motive power to certain muscles or sets of muscles, to which the anatomist's scalpel has traced them long ago. Moreover, it should be considered that, while disease of the other cerebral nerves is comparatively frequent, affections of the pneumogastric and the fifth, without simultaneous lesions of important neighbouring organs, are exceedingly rare. We have, therefore, up to the present time been obliged to trust almost exclusively to the results of vivisections as a guide to their physiology, while the corrective influence of pathological observations has been wanting. It appears to me, however, indisputable that the evidence derived from pathological cases, occurring in otherwise healthy adults, who can give a reasonable account of their symptoms, must be far superior to that which is merely deducted from vivisections, since animals cannot inform us of their sensations; and the conclusions drawn from their actions, reflex movements, and general aspect after operation, must to some extent be guesswork, depending upon the interpretation given of those phenomena by individual observers, and which may be, and often is, influenced by bias or prejudice. Moreover, animals frequently die a few days after the operation, so that any ulterior effects of the vivisection cannot be clearly ascertained.

Having been fortunate enough to observe, in the practice of the Infirmary for Epilepsy and Paralysis, a case of complete loss of function of the whole fifth pair of cerebral nerves, unaccompanied by any other affection of cerebral or nervous matter, an excellent opportunity has been afforded me of fully investigating the functions of the trifacial nerve, with special regard to certain points which are still involved in obscurity, and on which I trust that my observations will shed some light. A careful perusal of neuro-pathological literature has shown me that this case is unique in its kind, and may be looked upon, in a certain sense, as a complete physiological dissection of the fifth nerve, which has hitherto been wanting. I therefore consider it sufficiently important

to be brought before the Society, together with such remarks and conclusions as have been suggested by the phenomena observed.

P. G—, æt. 27, unmarried, a sheep-farmer living in Australia, had been in good health until June, 1866, when, on riding across a vast plain in Queensland, and being exposed to a keen wind blowing steadily into his face, he was suddenly seized by severe pain in the left side of the head, eyes, and face. At first the sensation was as if the face were frost-bitten. The pain then became of a dull, throbbing character, and continued so for five weeks. He put himself under the care of a local practitioner, who prescribed iodide of potassium and a blister. Some time after, on a similar exposure again taking place, the right side of the face became affected in the same manner, but the pain was not so severe, and the attack did not last so long as the first. When the pain was quite gone the corneæ of both eyes became covered with thick opacities, and the patient completely lost his sight on the right side, while on the left he could still faintly distinguish light and objects at a short distance. The power of mastication also became completely lost, and the skin and mucous membranes of the face quite numb. He then went to Sydney, where he was admitted into the hospital, in which he remained five months. The surgeon under whose care he was there ordered the eyes to be strapped up, probably with the intention of preventing perforation of the cornea (Snellen). As time went on, some of the symptoms were rather improved, but as the patient was still incapacitated from doing any work whatever, he came to England, and placed himself under my care.

I first saw the patient on April 21st, when I found him in the following condition:

His intellect and memory were in no way impaired. He was able to fix his attention on subjects just as well as previous to this affection; indeed, he complained much of the enforced idleness caused by the loss of his sight. This made him occasionally irritable and low-spirited. There

was a peculiarly hard, almost statuesque expression of the features, which was due partly to a slight œdematous effusion into the cellular tissue of the face and partly to the complete loss of muscular sensibility. On applying Faradisation by moistened conductors to the muscles of the face, these responded readily by contraction to the electric stimulus, but there was a complete absence of that peculiar sensation which, in a healthy person, always accompanies electro-muscular contractions, and which is caused by the stimulation of the sentient nerve-fibres which are distributed in the muscular substance. This latter was in no way affected, showing that the morbid influence had not reached the portio dura. Indeed, all the varieties of physiognomical expression could be produced at will, but the effect made was more like that of an automaton than the natural appearance of sentient and animated features.

The sense of smell was quite normal, and had never been impaired. On applying a sufficiently powerful continuous galvanic current to the mucous membrane of the nose, a decided phosphorous smell was perceived by the patient.

Vision was obstructed by thick leucoma of both corneæ, although the optic nerve was not affected. Indeed, the patient was able not only to distinguish light and shade with both eyes, but he could also see near objects, and read single letters of No. 20 (8-line Roman) of Jäger's test-types with the left eye, where the leucoma was not so thick as in the right. He was, however, quite unable to guide himself in the streets. He suffered a great deal from photophobia, and had to wear an eye-shade. This was a remarkable circumstance, as, in consequence of the leucoma of both corneæ, only very little light could penetrate to the retina.

Mr. Soelberg Wells has been kind enough to make a careful ophthalmoscopic examination of the fundus of the eye, and has furnished me with the following report of the appearances noticed by him:

"In both eyes the pupils became well dilated under atropine. In the right there are very delicate, thread-like adhesions between the edge of the pupil and the leucomatous

portion of the cornea. In the left eye there are slight remnants of uveal pigment on the central portion of the anterior capsule, indicating that a slight iritis had formerly existed. The lens and vitreous humour are clear, and the back-ground of the eye is quite normal. In the right eye, on account of the dense central leucoma, the optic disc, &c., could only be very imperfectly seen, but in the left eye it was quite visible."

The motor nerves of the eye were in their normal state, there being neither ptosis, nor strabismus, nor double vision, and all movements of the eyes, upwards, downwards, and laterally, being easy of execution.

The pupils were rather constricted, and were only very slightly influenced by variations of light and shade.

In describing the condition of the fifth nerve, I shall speak —1st, of the skin of the face and scalp; 2nd, of the mucous membranes of the eye, nose, and mouth; and 3rd, of the muscles of mastication.

1st. The common sensation of the face and scalp was entirely lost in both sides, the limit of the anæsthesia being, vertically, a line running one sixth part of an inch inwards from the horizontal and ascending branches of the lower jaw, and, horizontally, a line drawn from the tragus of one ear, right across the skull, to the tragus of the other ear. All the parts comprised between these lines, including the temples, forehead, nose, cheeks, and chin, had lost their sensibility. As regards the ears, the tragus was anæsthetic, and part of the external meatus benumbed, while the concha was perfectly sensible. In like manner the skin of the back part of the skull and the skin of the neck had preserved their ordinary sensibility.

In the anæsthetic parts of the face and scalp just alluded to, neither pricking, pinching, nor any other mechanical irritation, was in the least degree perceived by the patient. With regard to electricity, it appeared that Faradisation by dry conductors did not produce any sensation, even when a powerful current was used. On applying to the face the continuous galvanic current of ten cells of Daniell's battery,

which deflected the needle of the galvanometer to an angle of 35°, and which, in a healthy person experimented upon at the same time, caused not only a feeling of heat and pricking in those parts of the skin to which the electrodes were applied, but also a sensation of taste in the tongue, and a flash of light, chiefly on breaking the circuit, no physiological effect whatever was produced in the patient. On using a current of twenty cells of the same battery, which deflected the galvanometer to an angle of 50°, and in a healthy person caused contractions of the muscles of the face, both at the entrance and the cessation of the current, together with strong feelings of pricking and heat, vivid flashes of light, giddiness, strong galvanic taste, and a faint perception of a phosphorous smell, no sensations whatever were produced in the patient, but the facial muscles responded readily, chiefly on making the circuit. On further increasing the power of the current to thirty cells, which deflected the galvanometer to an angle of 72°, and in a healthy person caused the perception of dazzling flashes of light, strong phosphorous smell, and such powerful feelings of heat, giddiness, and sickness, as to be unbearable for more than a second, the patient perceived a slight sensation of warmth and pricking, a slight coppery taste, a slight phosphorous smell, and slight giddiness. These sensations had much the same degree of intensity wherever the poles were applied.

The sense of *temperature* was completely absent, for neither intense cold, as caused by the application of ether spray and ice, nor heat, caused the least sensation. This had been so from the commencement of the affection; and the patient had several times, on lighting a pipe, accidentally scorched his face without being aware of it at the time.

The sense of *touch* was entirely gone, for neither of the two points of the æsthesiometer was in the least degree perceived by the patient.

Nor was the sense of *locality* preserved, for the patient could not tell where he was touched or pinched.

2nd. *The mucous membranes of the eyes, nose and mouth.*

a. The conjunctiva of both eye and eyelid was completely

anæsthetic on both sides, and could be touched by the finger, and blunt and sharp instruments, without exciting reflex movements or lachrymation. The patient stated that, when he washed his face, he generally kept the eyes open, and never felt the contact of either water or soap. The secretion of the lachrymal gland appeared to have totally ceased, and the application of substances which generally excite a flow of tears, such as ammonia, mustard, &c., had no effect whatever. There was, however, pathological hyper-secretion of conjunctival mucus, by means of which the eye was kept moist. Indeed, the cornea appeared covered with streaks and shreds of mucus, which gave a peculiar death-like appearance to the eyes. This mucus was most probably secreted by those mucous follicles which have been first described by Professer Krause, and which are situated below the conjunctiva, where this membrane is reflected from the eyeball on to the eyelid.

b. The mucous membrane of the nose was quite insensible to the touch of blunt or sharp instruments, and no sneezing followed the application of snuff. There was, however, a most abundant secretion of mucus, which had, at one time, been so excessive, that thick scabs were continually forming in the nose. This mucus was of so acrid a nature that, on running down to the lip, it made the skin of the sulcus naso-labialis, and part of the lip beyond this sulcus, on both sides, very sore, and caused the moustache to fall out there. Otherwise the beard, and hair altogether, were in perfect condition, from which it appears that the growth of hair is not under the direct influence of the fifth nerve. That part of the upper lip where the acrid secretion from the nose used to run, appears now quite white, similar to a scar from burning, or from the application of sulphuric acid. At one time the nose used to bleed very readily when slightly touched, but it had not done so lately. The reaction of the nasal mucus is at present neutral.

c. The mucous membrane of the *mouth* was also completely anæsthetic, as far as the gums, the tongue, the inner surface of the cheeks, and the hard palate, were concerned. The

tongue presented a most frightful spectacle, having been severely bitten and lacerated in every direction during the act of taking food, the patient being entirely unconscious of his biting the tongue whenever he did so. Some parts of the inner surface of the cheeks had also been bitten, and were badly ulcerated. The secretion of buccal mucus was so excessive as to oblige the patient to have a pocket handkerchief constantly applied to the mouth, in order to prevent the liquid from running down the chin. The lips appeared covered with a sort of froth, such as we see it in a patient who has just come out of an epileptic attack. Both corners of the mouth were very sore, being macerated by the constant flow of mucus. The reaction of this liquid was slightly alkaline. The secretion of saliva appeared to be entirely arrested, and neither irritant substances, nor the movements of mastication, caused an increased flow of moisture in the cavity of the mouth.

The insensibility of the gums was so complete that, on one occasion, when the patient had a tooth drawn, he felt nothing whatever of the operation. The remaining teeth were perfectly healthy.

The sense of taste was not lost, for the patient tasted salt, sugar, and quinine, on the front as well as on the back part of the tongue. Yet, in the anterior part of that organ, the perception of taste seemed to have lost its quickness, for while, on my applying sapient substances to the posterior part of it, the patient would at once exclaim, "bitter," "sweet," "salt," he took about five or six seconds on the front part of the tongue to describe the taste, but he never made a single mistake there. He also perceived the galvanic taste of five cells of Daniell's battery, if applied directly to the tongue.

3. *The muscles of mastication.*

The muscles of mastication which are animated by the minor portion of the fifth nerve had not escaped the pathological influence. At one time the temporal and masseter muscles, which move the jaw upwards, were completely paralysed, so that it dropped, as in a dead body, and the mouth

was always open. Both pterygoid muscles being also completely paralysed, mastication was rendered impossible, and the patient never masticated the food he took for sixteen months consecutively. He was, therefore, obliged, when taking solid food, to have it cut very small, and then bolt it. Curiously enough digestion had never suffered in consequence of the want of mastication and insalivation, which I think must be explained by the circumstance that a thorough moistening and soaking of the food taken with a slightly alkaline liquid went on at least as copiously as it could have done before, owing to the pathological hyper-secretion of buccal mucus, of which I have already spoken, and which, therefore, in this case, seemed to exercise a kind of compensating influence.

For several months previous to the patient coming under my care, the voluntary power had gradually returned in the temporal and masseter muscles, so that the mouth could be closed, and the vertical movement of mastication was well carried out. The pterygoid muscles, however, remained paralysed, so that the lateral movement of the jaw was impossible. He had also much difficulty in putting out his tongue.

Other muscles animated by the minor portion of the fifth nerve are the mylohyoid, the digastricus anticus, the tensor palati mollis, and the tensor tympani. As regards the three first named, no morbid symptom could be discovered, showing that they were paralysed. The position and function of the soft palate were in no way altered, which is probably due to the circumstance that the tensor palati mollis receives nervous fibres, not only from the minor portion of the trifacial, but also from the pneumogastric and the accessory nerve.

The patient complained of a continuous rushing noise in the head, which he compared to that made by the paddle-wheel of a steamboat. It would, however, be difficult to determine at present whether this symptom was due to paralysis of the motor fibres animating the tensor tympani muscle, or to anæsthesia of the sentient petrosus superficialis

minor nerve, which proceeds from the ganglion oticum to the tympanic plexus of nerves.

The sense of hearing was perfectly normal.

The speech was rather thick and indistinct, in consequence of the lacerated condition of the tongue, but not from any affection of the hypoglossus nerve.

All the remaining parts of the nervous system were in good condition, nor was there any disorder of the chest, stomach, liver, bowels, skin, or genito-urinary organs.

There was no history of scrofula or syphilis.

Such being the condition of the patient, no real difficulty could be experienced in determining the nature and exact seat of the pathological lesion. The patient had evidently suffered from rheumatic inflammation of the neurilemma, first of the left and afterwards of the right trifacial nerve, where it emerges from between the transverse fibres of the pons varolii, at the base of the brain. This inflammation had resulted in effusion and subsequent compression and atrophy of nervous matter. The affection must be traced to the nerve-trunk at the base of the brain, and not to any more peripheral part, because not a single fibre of the fifth nerve had escaped the injury. If the lesion had been more peripheral, for instance, if it had been confined to the Gasserian ganglion, the muscles of mastication would not have suffered. At the same time it was evident that the disease could not have spread to the pons varolii, because there was an entire absence of all symptoms which occur in disease of the pons. *The lesion was therefore confined to the course of the fifth nerve, between the pons and the Gasserian ganglion.* As the case did not end fatally, it was impossible to verify the diagnosis by actual inspection, which, however, could have added but little to the pathology of the case.

The treatment consisted of the systematic application of the continuous galvanic current to the several branches of the fifth nerve, the positive pole being fixed as centrally as possible, while the negative was being gently passed along the peripheral ramifications of the nerve. No medicine was given.

After this treatment had been followed for about three months, with several interruptions due to extraneous circumstances, the following change had taken place in the patient's condition:

The symptom of photophobia had entirely disappeared. Indeed, the patient was able to leave off wearing the eye-shade after the first few applications of the galvanic current.

The tinnitus aurium was likewise almost entirely gone; it was only occasionally slightly perceived when the patient was lying down at bedtime.

The opacity of the cornea was considerably less on the left side. The patient can now read No. 10 (pica) of Jäger's test-types with the left eye, while, when he first came to me, he could with great difficulty make out single letters of No. 20 (8-line Roman). On the right side the improvement was also satisfactory, as the patient could read single letters of No. 20 with that eye. When I first saw him he was obliged to be led by another person, but now he was able to guide himself in the streets, to read the names of the streets at the street-corners, and to read the sign-boards of shops.

Common sensation had to a great extent returned in the left side of the forehead, the right cheek, and the chin. In the other parts of the face it was still considerably impaired.

The sense of locality in both sides of the face was re-established, for the patient could distinctly tell where he was touched or pinched.

The sense of temperature had come back to some extent, for the patient was able to distinguish between heat and cold, although not so keenly as previous to the affection.

The sense of touch had returned in the left side of the forehead, the right cheek, and part of the chin, as shown by the proper perception of the two points of the æsthesiometer.

The secretion of tears and saliva had to some extent returned; the excessive secretion of mucus had been considerably checked. The lips appeared now quite dry, and were no longer covered with froth.

The lateral motion of the muscles of mastication was to a great extent re-established.

The patient has been advised to continue the galvanic treatment, and I believe that the function of the fifth pair will, in course of time, be entirely restored by it. The patient is now quite able to follow a light occupation.

I conclude this paper with some remarks on various points in the physiology and pathology of the nervous system, on which the case just related appears to have an important bearing.

1st. The olfactory nerve is now admitted by the majority of physiologists to be the special nerve of the sense of smell; yet Magendie, to whom experimental physiology owes so much, concluded, from his experiments on dogs, that smell was only perceived by the nasal branch of the fifth pair, and that the olfactory was a nerve with the function of which we were not yet acquainted. The substances with which Magendie experimented were chiefly ammonia and highly odoriferous French cheese, and, as these things affect the common sensation of the mucous membrane of the nose just as much as the special sense of smell, Romberg justly objected to Magendie's experiments, that no sufficient distinction had been drawn between the *common* and the *special* sensibility of the nose. Romberg's criticism of Magendie's views was generally acquiesced in by the profession, and it is only lately that Claude Bernard has re-opened the question, and, without actually upholding the theory of his illustrious predecessor, adduced arguments to prove that we were not yet in a position to pronounce decisively on the relative functions of the olfactory and the nasal branch of the trifacial nerve. The fact, however, that in my patient the sense of smell was not in the least impaired, although the common sensibility of the mucous membrane of the nose was entirely lost, proves satisfactorily that the views of Magendie and Claude Bernard are untenable, that the trifacial has nothing to do with the perception of smell, and that the special nerve for that sense is the olfactory only.

2nd. The presence of *photophobia* in a case where the

entrance of light on the retina was almost entirely prevented by leucoma of the cornea, goes far to show that this symptom has little or nothing to do with the condition of the optic nerve or the retina. Indeed, M. Castorani has already drawn attention to the circumstance that in animals where the optic nerve has been divided an injury of the cornea will produce photophobia; and that able physiologist, Dr. Brown-Séquard, has shown that, after the section of the optic nerve, the iris still preserves the faculty of contracting under the influence of light and dilating in the shade, from which it would appear that the iris has a sensibility to light peculiar to itself, and independent of that of the retina. Now, the cornea receives nerves from the same source as the iris, that is, branches of the fifth which have passed through the ophthalmic ganglion. In my patient photophobia was one of the most troublesome symptoms, and only disappeared under the tonic and sedative influence of the continuous galvanic current. We are therefore led to look upon photophobia, if not always, at least under certain circumstances, as a neurosis of the corneal branches of the trifacial nerve, and, like many other neuroses, curable by galvanisation.

3rd. The physiology of the mucous membranes of the eye, nose, and mouth, is still in a very unsatisfactory condition as regards the question of the special kind of nervous influence by which the secretion is excited and by which it is regulated. Ludwig's experiments have thrown considerable light on the physiology of the salivary glands, by showing that Faradisation of the lingual and auriculo-temporal nerve causes an abundant flow of saliva, while Faradisation of the sympathetic arrests the secretion of saliva. Branches of the fifth pair are, therefore, the *exciting*, and sympathetic fibres the *inhibitory* nerves of salivary secretion. Now, it appears from the symptoms observed in the case of my patient, that just the reverse obtains as far as the secretion of conjunctival, nasal, and buccal mucus is concerned; since, for this latter function, the sympathetic appears to be the exciting, and the trifacial the inhibitory nerve. By assuming this to be the case, an easy explanation is offered of the pathological

hyper-secretion of conjunctival, nasal, and buccal mucus, which occurred in the case just related, after the inhibitory influence of the fifth pair was withdrawn, and the sympathetic was allowed to have full swing. It appears to me that thus a bountiful provision has been made in the distribution of nervous influence about the face, for exceptional circumstances, such as disease or accident. For, as the fifth nerve is endowed with imparting the secreting impulse to the lachrymal and salivary glands, and the sympathetic does the same for the conjunctival, nasal, and buccal mucous follicles, it appears that the important function of keeping the surfaces of the organs of special sense, and the commencement of the digestive and respiratory tract, properly moistened, has been entrusted, not to one, but to two separate nerves, either of which will to a certain extent discharge the function of the other, if that other should be incapacitated by disease or accident.

4th. The pathology of *tinnitus aurium* consists (to use the words of my friend, Mr. Hinton) "at present of a few scraps of positive knowledge, with a great deal of conjecture." Mr. Hinton believes that this symptom has not any precise pathology in the sense of having any uniform cause, but that its pathology is like that of neuralgia. The case of my patient shows that, at least under certain circumstances, tinnitus aurium is a symptom of neurosis of the trifacial nerve, and, like many other neuroses, curable by galvanisation.

5th. I have now to consider the question whether the sense of taste is dependent upon the glosso-pharyngeal nerve, or upon the lingual branch of the fifth. There is hardly another point in the physiology of the cerebral nerves about which so much discrepancy exists amongst the best observers. Thus Bérard, Burrows, Stamm, Noble, and Vogt, are in favour of the glosso-pharyngeal, while Sir Charles Bell, Bishop, and Blasius, have attributed the faculty of taste to the lingual nerve. Amongst the more recent writers on this subject, Romberg sided for the glosso-pharyngeal, while Claude Bernard maintained that the two anterior thirds of

the tongue received the faculty of taste from the fifth, and only the posterior third of that organ from the glosso-pharyngeal. I believe that the case just related is decisive as to the correctness of Romberg's view. At the same time I am led to think that the quickness of the perception of taste is materially enhanced by a normal condition of the fifth pair; for, as I have already stated, my patient generally required five or six seconds before he could make out the nature of the sapient substance on the anterior part of the tongue.

6th. Finally, I have to make some remarks upon the curious fact of the absence of cerebral symptoms during the application of a powerful continuous galvanic current to the face and head. Authors are far from unanimous as regards the question of the action of galvanism on the nervous centres. Many observers deny that galvanism acts at all on the brain and spinal cord if only such a strength be used as is medically applicable, founding their opinion on the fact that the nervous centres are encased in thick masses of badly conducting osseous tissue, which they think would prevent the arrival in them of the electric current, since the latter prefers following good conductors, such as cellular tissue, muscles, and the like. This opinion, however plausible at first sight, is refuted by the every-day experience of physicians who occupy themselves with the medical application of electricity, and I have no doubt that in course of time it will be completely abandoned. Two theories have been put forward to explain the cerebral symptoms, such as giddiness, dizziness, sickness, &c., caused by the application of the continuous current to the head and face—one by myself and the other by Dr. Erb, of Heidelberg. My theory was, that these effects are produced by reflex action from the peripheral branches of the fifth pair to the base of the brain; while Dr. Erb is of opinion that the current is directly transmitted to the cerebral substance, right through its bony case, and more especially by way of the blood-vessels, which penetrate from without to the inside of the skull. The principal reason for my theory was, that we see cerebral

symptoms produced, not only by sending the current straight through the head, as, for instance, when one pole is put to the occiput and the other to the forehead, or one to the right and the other to the left temple, but also by applying the poles of the battery to any parts of the face close together, where no portion of the brain is included within the galvanic circuit; and this argument has never been refuted.

I look upon the present case as a decided corroboration of the correctness of my views; for it appeared that, when the reflex function of the fifth pair was in abeyance, no cerebral symptoms could be produced, even if the current was sent straight through the head; and it was only by increasing the galvanic power to such a degree as to rouse the faint remnant of sensibility of the trifacial nerve that a slight feeling of giddiness was caused. Now, as the physical relations of the skull, brain, and blood-vessels were in no way altered in this case, there ought to have been no alteration as regards the production of cerebral symptoms, if Dr. Erb's theory were correct. But, as there was a most decided diminution of cerebral response, it is satisfactorily proved that the transmission of the continuous galvanic current to the brain is effected, not physically, but physiologically, by nervous action. The settlement of this question, which has for a long time been a vexed one for all those who have occupied themselves with electro-physiology and electro-therapeutics, I look upon as one of the most satisfactory deductions from the case which I have submitted to your consideration.

REMARKS

ON THE

NATURAL HISTORY OF RHEUMATIC FEVER.

BY

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AND

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Received Dec. 8th, 1868.—Read Jan. 12th, 1869.

In this paper we are desirous of bringing under the notice of the profession the particulars of a few more cases of rheumatic fever which have been treated by mint-water, or, in other words, by absolute rest and regulated diet, unaided by medicine.

In our previous reports on this subject (recorded in the 'Guy's Hospital Reports') we have endeavoured to show what is the natural course of rheumatic fever.

We have, moreover, shown what is the class of case that tends to do well, to recover more quickly than any other class, and have further pointed out what class of case does not tend to recover quickly, but becomes protracted and very liable to relapse.

We are now desirous of pointing out what appears to be

the natural course of rheumatic fever with reference to the heart; to show in what proportion of cases the heart has become diseased when the patients were treated by mint-water; and to consider if there be any evidence to prove that the heart is more frequently involved where cases are treated by mint-water, or where treated by alkalies, lemon-juice, or by the application of blisters to the joints.

This report is based on twenty-five cases of rheumatic fever, all of which have been carefully watched by one of us.

Four of these cases were under the care of Dr. George Owen Rees, in Guy's Hospital (*vide* 'Guy's Hospital Reports,' vol. xi, third series, 1865); eight of the cases occurred in the same hospital under the care of Drs. Barlow, Rees, and Gull (*vide* 'Guy's Hospital Reports,' vol. xii, third series, 1866); and the remaining thirteen cases have occurred in the London Hospital. The thirteen patients were admitted into the London Hospital under the care of Dr. Herbert Davies, Dr. Andrew Clarke, and Dr. Ramskill. They were, however, subsequently transferred to the care of Dr. H. G. Sutton, who here begs to acknowledge the kindness and liberality of his colleagues, and to mention that Drs. Davies, Clarke, and Ramskill have at all times most generously allowed him to make use of their cases.

Twelve of these twenty-five cases have been already recorded in the 'Guy's Hospital Reports;'[1] it is therefore only necessary to give the clinical particulars of the remaining thirteen cases.

Of these 25 cases, 18 were females and 7 were males.

The ages of these patients were as follows:—The youngest was twelve years old and the oldest was twenty-five years. The average age was nineteen years. No objection could therefore be raised against the cases on account of age, for experience has shown that persons under twenty suffering from rheumatic fever are very liable to have heart affection, and that females, to a greater extent than males, are exposed to this complication.

[1] Vol. xii, 3rd series, 1866; *vide* cases 1, 2, 3, 5, 7, 8. Vol. xi, 1865; *vide* Dr. G. O. Rees' cases 1, 3, 4, also Dr. Gull's cases 1, 2, males, and 8, females.

We may now be permitted to record the particulars of the following thirteen cases.

CASE 1.—Emma L—, æt. 17, was admitted into the London Hospital December 20th, 1867. Her illness commenced eight days before admission with pain in all her limbs. This was her first attack of rheumatic fever. On admission she had a good deal of pain in several joints. The temperature in the axilla was 104, pulse 144, respiration 44.

On the second day of admission the pain continued; she perspired profusely, and the rheumatic odour was well marked. The temperature was 103·2, pulse 124, and respiration 40.

On the third day, the 22nd December, the temperature was

102·6 in the morning. Pulse 138. Respiration 44.
103·5 „ evening. „ 132. „ 36.

23rd.—Fourth day of admission, had pain in the chest, otherwise free; could turn in bed without any difficulty; tongue almost clean; perspired freely; urine clear, acid.

Temperature	101·8	morning.	Pulse	120.	Respiration	20.
„	102·	evening.	„	138.	„	—
24th, 5th day,	102·4	morning.	„	120.	„	36.
25th, 6th day,	99·2	morning.	„	120.	„	36.
„	100·	evening.	„	100.	„	32.
26th, 7th day,	98·4		„	100.	„	36.
27th, 8th day,	98·		„	100.	„	32.
28th, 9th day,	97·		„	90.	„	24.
29th, 10th day,	97·		„	80.	„	—

On the seventh day from admission, and the fifteenth of her illness, the temperature was normal; the pulse varied from 92—100, respiration from 22—36.

On the eleventh day, and nineteenth day of her illness, the temperature had remained normal for four days. Her pulse was 80, and the respiration had fallen to 24. She was in no pain, and her tongue was clean, and she continued from this time to do well. The acute symptoms are calculated to have terminated on the eleventh day, but the temperature was normal on the seventh day, and continued so from that day,

and this might be considered as the termination of the acute symptoms. The patient was not, however, entirely free from pain until the eleventh day, and the acute symptoms, therefore, are estimated to have ceased on the eleventh day. The total duration of her symptoms, dating from the time that her illness commenced, that is, eight days before admission, to the cessation of acute symptoms, was ten days.

Heart.—The heart's action was rapid and the impulse beat was unduly marked, but there was no abnormal sound throughout her illness.

Case 2.—Catherine C—, æt. 24, admitted into the London Hospital December 28th, 1867. This was her first attack of rheumatic fever. Her illness commenced five days before admission with pain in the left foot. She was very thirsty and had lost her appetite. On admission she complained of pain in her feet and knees. Her joints were somewhat swollen, hot, and red; her tongue was white; her appetite was bad; her face flushed and her throat was sore; pharynx congested, but there was no ulceration. The temperature was 102·4, pulse 120, respiration 36. Ordered diet of milk and beef-tea, and an ounce of mint-water three times a day.

On the 29th, the second day of admission, had slept pretty well. Pain in the right wrist in addition to the joints previously affected. Temperature 101, pulse 116, respiration 27. Ordered ten grains of Dover's powder at bedtime.

30th.—Third day. Slept well. Pain in left shoulder, also a little pain in right knee and ankle; perspiring. Urine, sp. gr. 1030, slightly acid.

Temperature	100·5 morning.	Pulse	100.	Respiration	40.
„	101·6 evening.	„	104.	„	32.
31st, 4th day	100·4 morning.	„	100.	„	24.
„	102·5 evening.	„	112.	„	36.

January 1st.—Fifth day, she was in much less pain.

Temperature	100·2 morning.	Pulse	104.		
„	100·6 evening.	„	108.		
2nd, 6th day,	100·2	„	92.		
3rd, 7th day,	99·2	„	84.	Respiration	24.

She was completely free from pain, excepting a little in the left shoulder-joint, but so little that she could move her arm freely; her tongue was clean and moist, and she did not perspire so much. Her pulse was normal, having fallen from 120 to 72; her respirations from 36 to 20. The temperature had fallen from 102 to 99·2 and 99·5; it was therefore almost normal.

6th.—On the tenth day the temperature was 98·4, pulse 72, respiration 20. On the eleventh day of admission the temperature was 98·4, pulse 60, respiration 20. The temperature was carefully taken during the five following days, and it never exceeded 98·5. The acute symptoms are calculated to have ended on the eleventh day. The total duration of her acute symptoms, including the five days before admission, was sixteen days. She was discharged February 7th.

Heart.—On the day of admission the cardiac dulness was normal; over both apex and base the first sound was prolonged. On the third day the first sound was still prolonged. On the fifth day it was prolonged. On the seventh day there was a well-marked systolic bruit over the third interspace close to the sternum; and the first sound was prolonged at the apex. On the ninth day the cardiac dulness was normal, and a feebly marked systolic bruit was heard over the base; the first sound at the apex was prolonged. On the seventeenth day the murmur was still faintly heard.

February 1st.—On the thirty-second day the cardiac dulness was normal, action quiet, and there was no abnormal sound.

Case 3.—Alfred W—, æt. 17, was admitted into the London Hospital October 25th, 1867. This was his first attack of rheumatic fever. His illness commenced six days before admission with pain and swelling in his left knee and ankle, and with thirst and loss of appetite. On admission he complained of great pain in his joints; his face was flushed, and he was very thirsty. The temperature in axilla was 102·4, pulse 92, respiration 28.

On the second day of admission he could not turn in bed; there was great pain in the right ankle and in the wrists.

He complained of sore throat, and some cheesy deposits were noticed on the tonsils. Temperature was 100, pulse 104, respiration 36. An ounce of mint-water every four hours was ordered, and milk and beef-tea for diet.

On the 27th, the third day, he could not move in bed on account of the pain in his joints. Tongue was dry in the centre; urine acid, sp. gr. 1025; passed fifty ounces in twenty-four hours. Temperature 102·8 morning, 102·4 evening; pulse 80, respiration 28.

On 28th, fourth day, pain, redness, and a little swelling in wrists, right knee, and ankle. Temperature 102·4 morning, 102 evening.

On 29th, fifth day, temperature 102 morning, 101 evening.

On 30th, sixth day, not in so much pain; sweating; rheumatic odour strongly marked. Temperature 101 morning, 104 evening. Ordered half a grain of opium every four hours during the night only.

On 31st, seventh day, he had slept better, sweating profusely. Temperature 100·8 morning, 101 evening. He was ordered half a grain of opium night and morning.

November 1st, felt better; in less pain; tongue clean; urine, passed thirty-five ounces in twenty-four hours, acid, sp. gr. 1020. Temperature 100 morning and evening.

2nd, ninth day, temperature 98·6 morning, 99·2 evening. Felt better, in much less pain.

3rd, tenth day, temperature 99 morning, 99·8 evening.

4th, eleventh day, temperature was normal, 98·4 morning, 98·5 evening.

5th, twelfth day, free from pain; tongue clean; urine acid, natural colour, passed thirty-five ounces in twenty-four hours, sp. gr. 1018.

8th.—On the fifteenth day he was out of bed, free from pain; appetite good; and placed on middle diet.

The acute symptoms had very greatly subsided on ninth day, and they continued to do so, and on the twelfth day they had completely subsided. The total duration of the acute symptoms, including the six days before admission, was eighteen days.

On the twentieth day he had continued to do well, and was free from pain. Discharged December 3rd, on the fortieth day.

Condition of the heart.—On the day of admission the apex impulse was unduly marked, there was no murmur, and the cardiac dulness was normal. On the 27th, the third day, the first sound was markedly prolonged under the left nipple. Over the third left costal cartilage it was so prolonged that it might fairly be called a slight systolic bruit. Cardiac dulness extended to the third rib; impulse was unduly marked. On the fifth day heart in same condition. On the eighth day the bruit was still heard at the base and also at the apex, but loudest at the base. On the twelfth day the rhythm was irregular and the bruit was still heard. On the fifteenth day the bruit was doubtful. December 3rd, when discharged, his heart was carefully examined; there was no abnormal sound; the cardiac dulness was normal; the apex beat was in its normal position. The heart was, therefore, as far as could be appreciated, healthy.

Case 4.—George M—, æt. 13, admitted into the London Hospital January 17th, 1868. This was his first attack of rheumatic fever. His illness commenced five days before admission with pain in his feet; his joints were swollen; he was thirsty and sweated a good deal. On the day of admission the rheumatic odour was well marked. He was thirsty, his appetite was bad, and there was pain and redness of his shoulder-joints and hands. His urine was acid, the specific gravity 1030; temperature 100·6, pulse 80, respiration 28. On the second day of admission, the temperature had fallen to 98·8. On the third day he was free from pain, his tongue was moist and slightly coated. On the 4th day he was much better and in no pain, but the joints were a little stiff. The acute symptoms had entirely subsided on the fourth day, and it might be said on the third day.

The condition of the heart.—The total duration of the acute symptoms, including the five days before admission, was nine days. There was a systolic, apparently an aortic, bruit

over the heart on admission, which remained when the patient was discharged.

Case 5.—Rebecca D—, æt. 18, admitted into the London Hospital January 28th, 1868. This was her first attack of rheumatic fever. Her illness commenced one day before admission with pain in the feet. On the day of admission her wrists were red and swollen, as well as the ankles. She perspired profusely. Her cheeks were flushed, and she was very thirsty. The urine was acid, and the specific gravity was 1030. The temperature 102·2, her pulse 120, respiration 28.

On the 29th, second day of admission, the temperature was
102·2 in the morning. Pulse 114. Respiration 28.
101·8 in the evening. „ 124. „ 32.

30th, the third day of admission, the temperature was
102·6 in the morning. Pulse 124. Respiration 40.
102·6 in the evening. „ 128. „ 36.

31st, the fourth day of admission, the temperature was
102 in the morning. Pulse 116. Respiration 32.
102·4 in the evening. „ 120. „ 32.

February 1st, the fifth day, the temperature was
102·6 in the morning. Pulse 112. Respiration 32.
101·2 in the evening. „ 112. „ 28.

Pain and redness in the left wrist, but nowhere else. Skin perspiring and covered with miliaria.

2nd, the sixth day, pain in right wrist; urine faintly acid, sp. gr. 1014; temperature was
101·4 in the morning. Pulse 96. Respiration 28.
101·2 in the evening. „ 92. „ 30.

3rd, the seventh day, sweated profusely, copious miliaria, pain in wrist only; urine was neutral, sp. gr. 1010, contained lithates; temperature was
102 in the morning. Pulse 88. Respiration 24.
101·6 in the evening. „ 100. „ 28.

4th, the eighth day, the temperature was
99·2 in the morning. Pulse 80. Respiration 20.
99 in the evening. „ 72. „ 28.

5th, the ninth day, the temperature was

99 in the morning.	Pulse 84.	Respiration 24.
100 in the evening.	,, 88.	,, 24.

6th, the tenth day, the temperature was

99·2 in the morning.	Pulse 80.	Respiration 24.
99·4 in the evening.	,, 88.	,, 28.

7th, the eleventh day, the temperature was

98·6 in the morning.	Pulse 88.	Respiration 26.
98·6 in the evening.	,, 88.	,, 24.

On the 4th she was in no pain, appetite was good, tongue was almost clean. Urine acid, sp. gr. 1015. Judging from these symptoms and the temperature, the acute symptoms appear to have ended on this day, *i. e.* the eighth day of admission. On the eleventh day she was quite convalescent; temperature normal. The total duration of the acute symptoms, including the day she was ill before admission, was nine days. She continued to do well and was discharged.

State of the heart.—On the day of admission there was diminished resonance as high as the second interspace; marked dulness as high as the third rib, and the dulness was bounded below by the fifth interspace; the apex beat was unduly marked in the fourth interspace, and a little to the right of the nipple. In the third left interspace, close to the sternum, the first sound was prolonged, and at the apex also. On the fourth day of admission the first sound over the base of the heart resembled a faint bruit. On the fifth day it was a decided bruit, audible both at the base and apex. On the fourteenth day a systolic bruit was heard over the apex accompanied by a thrill; and when the patient was discharged the systolic bruit over the apex remained.

Case 6.—Elizabeth W—, æt. 14, admitted into the London Hospital August 22nd, 1867. Her first attack of rheumatic fever. Suffered with an aching sensation in her leg fourteen days before admission; seven days before admission she had pains in the legs and hands. Two days afterwards she was laid up with pain and swelling in ankles and knees, and she remained in much the same state until she entered the

hospital. On the day of admission she had pain, redness, and some swelling, in her ankles and knees. Slight pain in the arms, tongue furred. Temperature was 102·4, pulse 120, respiration 36. Ordered one ounce of mint-water every four hours, five grains of Dover's powder every night at bed-time. Diet milk and beef-tea.

23rd, on the second day, the temperature was

101·6 in the morning. Pulse 116. Respiration 36.
103·6 in the evening. „ 116. „ 44.

24th, third day, the temperature was

100·6 in the morning. Pulse 104. Respiration 36.
101·4 in the evening. „ 104. „ 44.

The Dover's powder was discontinued.

25th, fourth day, pain and swelling in the left wrist; perspiring; temperature 100, pulse 92, respiration 34.

26th, fifth day, not in so much pain; temperature 99, pulse 84, respiration 26.

27th, sixth day, free from pain; temperature 98, pulse 72, respiration 32.

28th, seventh day, in no pain; appetite good; tongue clean; skin cool, and not perspiring. The acute symptoms terminated on the sixth day. The total duration of acute symptoms, including the seven days before admission, were thirteen days. She was discharged on September 20th.

State of heart.—On the day of admission there was absolute dulness as high as the upper margin of the left third rib, and diminished resonance as high as the second left costal cartilage. The area of dulness was oval-shaped. It was bounded on the left by a vertical line through the nipple, and on the right by the left margin of the sternum, and below by the fifth rib. The first sound over the apex of the heart was short and sharp. Over the third left costal cartilage it was prolonged, and over the second left costal cartilage it was a decided but feeble systolic bruit; it was only heard over this spot. No thrill could be felt. On the third day of admission the bruit was heard all over the base of the heart. Cardiac dulness the same as before. On the fourth day the apex beat was unduly marked in the fourth and fifth inter-

spaces, and the systolic bruit was very distinctly heard over the second interspace, louder on the left than on the right. The bruit was not heard at the apex, and not conducted along the aorta. On the seventh day of admission there was a faint systolic bruit over the left second interspace, close to the sternum. The bruit was very localized, and not so distinctly heard as it was three days ago. On the twentieth day of admission there was still a slight systolic bruit over the base. Heart otherwise healthy. On the twenty-third the heart was normal, excepting that there was still heard a faint systolic bruit. It was more like a prolonged first sound than a bruit. When discharged, this abnormal character of first sound was faint and not well marked.

Case 7.—Mary Anne N—, æt. 21. Admitted into the London Hospital December 24th, 1867. Her first attack of rheumatic fever. Good health until twelve days before admission. At that time was seized with pain and swelling in her wrists and shoulders. Eight days before admission was obliged to go to bed, not able to stand on account of the pain in her legs, and was confined to bed until the day she was admitted into the hospital. On the day of admission she had pain in her knees, shoulders, and wrists. Her tongue was coated with yellow fur; her face was flushed, and she perspired freely. Temperature was 101·6, pulse 124, respiration 28. Ordered diet of milk, beef-tea, and lemonade; and an ounce of mint-water three times a day.

25th, the second day of admission, the temperature was
100·4 in the morning. Pulse 112. Respiration 24.
101 in the evening. „ 112. „ 28.

26th, the third day, the temperature was
100·8 in the morning. Pulse 108. Respiration 20.
101·2 in the evening. „ 108. „ 28.

Complained of pain in the chest and sore throat. Sibilant respiration heard over front of the chest.

27th, the fourth day, pain in left knee, shoulder, and wrist. Sweated freely. Rheumatic odour was well marked.

Temperature was

99·4 in the morning. Pulse 108. Respiration 28.
101 in the evening. „ 108. „ 28.

Ordered linseed-meal poultice to be applied to the chest.

28th, the fifth day, ordered half an ounce of castor oil to be taken immediately, and a quarter of a grain of morphia at bedtime. Temperature was

99 in the morning. Pulse 104. Respiration 24.
99·8 in the evening. „ 108. „ 28.

29th, sixth day, pain equally severe in left shoulder and right knee as it was three days ago. Tongue was clean, appetite much better; perspired freely; temperature was

100 in the morning. Pulse 104. Respiration 24.
98·4 in the evening. „ 108. „ 24.

31st, eighth day, she was in no pain excepting in the left shoulder; temperature was

100·2 in the morning. Pulse 104. Respiration 24.
100·6 in the evening. „ 108. „ 24.

January 1st, ninth day, temperature was

99 in the morning. Pulse 88. Respiration 16.
101 in the evening. „ 96. „ 20.

2nd, tenth day, temperature was

98·5 in the morning. Pulse 104. Respiration 24.
100·2 in the evening. „ 96. „ 24.

3rd, eleventh day, temperature was

100·4 in the evening. Pulse 92. Respiration 20.

Free from pain.

4th, the twelfth day, temperature was

98·8 in the morning. Pulse 88. Respiration 18.
99·5 in the evening. „ 96. „ 24.

5th, thirteenth day, temperature was

98·4 in the morning. Pulse 80. Respiration 24.
99·5 in the evening. „ 80. „ 24.

6th, fourteenth day, temperature was

98·4 in the morning. Pulse 80. Respiration 24.
99·5 in the evening. „ 84. „ 28.

7th, fifteenth day, temperature was

98·8 in the morning. Pulse 76. Respiration 24.
100 in the evening. „ 92. „ 20.

8th, sixteenth day, temperature was
98·6 in the morning. Pulse 72. Respiration 24.
99·2 in the evening. ,, 88. ,, 20.

9th, seventeenth day, temperature was
99·0 in the morning. Pulse 72. Respiration 24.
99·0 in the evening. ,, 68. ,, 24.

10th, eighteenth day, the temperature was
99·0 in the morning. Pulse 68. Respiration 24.
99·0 in the evening. ,, 80. ,, 24.

11th, nineteenth day, temperature was
98·4 in the morning. Pulse 80. Respiration 24.
98·2 in the evening. ,, 78. ,, 24.

12th, twentieth day, temperature was
98·0 in the morning. Pulse 68. Respiration 24.
98·6 in the evening. ,, 84. ,, 20.

13th, twenty-first day, temperature was
98·0 in the morning. Pulse 72. Respiration 24.
98·6 in the evening. ,, 88. ,, 24.

14th, twenty-second day, temperature was 98·0, pulse 72, respiration 24, and she was out of bed, doing well.

In this case the temperature was normal or almost normal, not exceeding 99·5 on the twelfth day.

On fifteenth day it was normal in the morning and 100 in the evening. On sixteenth day it was normal, and remained so.

We may, therefore, perhaps, fairly conclude that this patient was convalescent on fifteenth day, and it is to be noticed that she was totally free from pain on eleventh day, and continued free from it. The total duration of acute symptoms, including the twelve days before admission, was twenty-eight days.

Condition of the heart.—On admission cardiac dulness was normal, apex impulse unduly marked; there was a systolic bruit over the third left interspace, close to the sternum. The bruit was not conducted along the aorta. On 22nd, fourth day, cardiac dulness extended as high as the second left costal cartilage; oval-shaped. Bruit the same as before.

29th, sixth day, heart in the same condition. Thirteenth day, cardiac dulness was normal, and no bruit was heard.

On twenty-third day the heart was normal.

CASE 8.—Jessie C—, æt. 18, admitted October 29th, 1867. Her first attack of rheumatic fever. Eleven days before admission she had pains in her limbs; four days before, she was obliged to go to bed. On the day of admission complained of pain in her thighs, knees, ankles, and left arm. Appetite bad; tongue red in the centre and furred at the sides; temperature 100·4, pulse 100, respiration 24. Ordered 1 oz. mint-water every four hours, ¼ grain morphia at bedtime. Milk and beef-tea for diet.

30th, second day.—Temperature 101, pulse 92, respiration 24; was in great pain; perspired very much.

31st, third day.—Temperature 101·4, pulse 100, respiration 32.

November 1st, fourth day.—Was in more pain, which was great in left leg; redness and swelling in left wrist; perspired a great deal; urine acid, contained no albumen, sp. gr. 1021. Temperature—

102 morning. Pulse 76. Respiration 24.
101·8 evening. ,, 72. ,, 32.

Ordered ½ grain opium twice a day to relieve the great pain.

2nd, fifth day.—Unable to move in bed; in great pain. Temperature—

101·4 morning. Pulse 98. Respiration 22.
102 evening. ,, 108. ,, 30.

3rd.—Temperature 102·2, pulse 108, respiration 28. Ordered ½ oz. castor oil.

4th, seventh day.—Temperature—

101·8 morning. Pulse 102. Respiration 24.
102·8 evening. ,, 100. ,, 20.

5th, eighth day.—Suffered great pain. Temperature—

102·4 morning. Pulse 104. Respiration 20.
102·3 evening. ,, 120. ,, 32.

Ordered 1 grain opium every four hours.

6th, ninth day.—Temperature 102, pulse 116, respiration 30.

7th, tenth day.—Great pain in shoulder; less pain in legs; perspired freely. Temperature—

102·2 morning. Pulse 108. Respiration 36.
102·4 evening. „ 112. „ 32.

8th, eleventh day.—She complained very much of pain of her joints. Temperature—

103 morning. Pulse 120. Respiration 30.
102·4 evening. „ 112. „ 28.

Ordered 1 grain opium twice a day. Temperature remained at 100 until November 14th, the seventeenth day, when the pain was much less. Temperature—

99 morning. Pulse 72. Respiration 20.
99 evening. „ 80. „ 22.

15th, eighteenth day.—Temperature—

98 morning. Pulse 80. Respiration 18.
98·4 evening. „ 80. „ 18.

17th, twentieth day.—Was free from pain; temperature normal; appetite returning.

27th, thirtieth day.—Had had no return of the pain; appetite was good; tongue clean; skin cool; was anxious to get up.

December 5th.—She was quite well and discharged. The acute symptoms had undoubtedly ceased on the nineteenth or twentieth day.

The total duration of acute symptoms, including eleven days before admission, was thirty-one days.

Condition of heart.—On the day of admission a systolic bruit was heard. On the third day there was a harsh bruit at the base; cardiac dulness reached as high as the second interspace; systolic bruit was heard over the base. On the tenth day this bruit was heard also at the apex. On the thirty-first day, November 28th, the dulness was normal, first sound feeble, second sound unduly marked, but there was no abnormal bruit.

Case 9.—Rachel L—, æt. 12, admitted into the London

Hospital October 29th, 1867. Six weeks before admission she was laid up a fortnight with pain in her limbs; subsequently she improved; the pain afterwards returned, and she was very weak. On the day of admission she was very anæmic-looking and had little pain in her joints. On the second day of admission temperature 101, pulse 102, respiration 38. On the third day the temperature was 101, pulse 102; the tongue was slightly coated, and she had pain in both knees. On the fifth day she was free from pain, the temperature was normal, and she continued to do well. The acute symptoms in this case had terminated by the fifth day. The arthritis was not severe. The total duration of the acute symptoms, including the days she was ill before admission into the hospital, could not be calculated.

State of the heart.—The cardiac dulness was increased and reached as high as the second costal cartilage. Over the base a thrill was felt, and a superficial creaking sound accompanied both sounds of the heart, apparently the result of pericarditis. There was a systolic bruit at the apex on admission, and when she was convalescent there was a well-marked systolic bruit over the apex of the heart which was conducted along the axilla.

Case 10.—Annie A—, æt. 15, admitted October 25th, 1867. Her first attack of rheumatic fever. She had suffered from pain in her knees and back ten days before admission. She was confined to bed only two days before admission. The day she entered the hospital the temperature was 102·4, pulse was 128, respiration 28. She had pain in several joints. Her tongue was furred, the urine was acid and its specific gravity was 1035. Ordered a mixture containing a little coloured syrup and water every four hours.

26th, second day.—Temperature—

101·6 morning.	Pulse 128.	Respiration 32.
102·4 evening.	„ 120.	„ 34.

27th, third day.—Temperature—

101 morning.	Pulse 116.	Respiration 28.
101·4 evening.	„ 120.	„ 28.

28th, fourth day.—Temperature—

101 morning. Pulse 116. Respiration 20.
102·6 evening. „ 129. „ 28.

Ordered 1 grain opium to be taken at bedtime.

29th, fifth day.—Temperature—

103 morning. Pulse 120. Respiration 30.
101 evening. „ 120. „ 36.

30th, sixth day.—Pain in both hands. Temperature—

101·4 morning. Pulse 120. Respiration 28.
100·6 evening. „ 116. „ 32.

31st, seventh day.—Temperature—

101·4 morning. Pulse 112. Respiration 30.
102 evening. „ 116. „ 24.

November 1st, eighth day.—In no pain; her limbs felt stiff. Ordered ½ oz. castor oil. Temperature—

101·2 morning. Pulse 96. Respiration 22.
100 evening. „ 112. „ 20.

2nd, ninth day.—Felt better; in no pain, except a little in right shoulder; urine scanty, acid, sp. gr. 1032. Temperature—

101 morning. Pulse 112. Respiration 20.
100·4 evening. „ 112. „ 24.

3rd, tenth day.—Temperature—

98·6 morning. Pulse 112. Respiration 32.
100·2 evening. „ 110. „ 28.

4th, eleventh day.—Temperature—

99·6 morning. Pulse 120. Respiration 30.
99·8 evening. „ 96. „ 24.

5th, twelfth day.—She had been free from pain three days; her appetite was good; she did not perspire, and her tongue was clean. Sp. gr. of urine 1026. Temperature—

98 morning. Pulse 88. Respiration 26.
99 evening. „ 96. „ 20.

7th, fourteenth day.—In no pain; appetite good. Temperature—

98 morning. Pulse 80. Respiration 20.
99·6 evening. „ 88. „ 28.

She continued to do well and had no return of pain.

13th, twentieth day.—Out of bed.

On 27th, thirty-fourth day of admission, discharged.

In this case the acute symptoms had completely disappeared on the twelfth day. The total duration of acute symptoms, including the time that she was ill before coming into the hospital, might be calculated at twenty-two days, or, perhaps, more correctly speaking, at thirteen days.

Condition of the heart.—On admission a systolic bruit was heard over the base of the heart; apex beat diffused. On the 30th October it was still heard. November 1st, a systolic bruit was heard under the left nipple. When discharged the murmur was still heard at the apex and at the angle of the left scapula.

Case 11.—Annie D—, æt. 14, was admitted into the London Hospital October 25th, 1868. Her first attack of rheumatic fever. Her illness commenced three days before admission with pain in her right leg. The day before admission she was compelled to lie up. The day she came into the hospital there was pain in both knees and shoulders; the knees were red and swollen. On the second day the temperature was 101·2, pulse 124, respiration 32. On the third day the temperature was 99 and 99·8, pulse 104, respiration 24. On the fourth day she was in less pain and temperature was normal. On the seventh day she was free from pain; her tongue was clean; the temperature was normal; the urine was slightly acid, its specific gravity 1019. After this she rapidly improved.

Here the acute symptoms had ceased on the seventh day, and the total duration of acute symptoms, including three days before admission, was ten days.

Condition of the heart.—There was a systolic bruit at the base on admission and when discharged from the hospital.

Case 12.—Henry K—, æt. 17, admitted into the London Hospital January 11th, 1868. His first attack of rheumatic fever. His illness commenced three weeks before admission with pain in his limbs. On the day of admission he had

pain and swelling in the right wrist and shoulder; perspiring freely; temperature 100·5, pulse 112, respiration 20. Three days after this he was free from pain. Temperature 98·8, pulse 84, respiration 16, and he continued to do well.

Condition of the heart.—On the 13th January, the third day of admission (the state of the heart is not mentioned in the report-book until the 13th), the heart's impulse was unduly marked and a bruit was heard over the apex.

16th.—The murmur was heard over the base and apex, but very faintly heard over the apex.

20th.—No abnormal sound was heard over the heart.

The acute symptoms had ended in this case on the third day of admission, and the total duration of the rheumatic symptoms, calculating the twenty-one days before admission, was twenty-four days.

Case 13.—Sarah B—, æt. 16, admitted into the London Hospital January 10th, 1867. Her first attack of rheumatic fever. Four days before admission had pains in her thighs, which extended to her knees and feet.

On the 11th and 12th, the second and third days of admission, there were no decided rheumatic symptoms. There was no visible affection in any joint; she could stand and move about without any apparent pain or discomfort.

13th, the fourth day of admission.—There was much pain and slight swelling in the ankles.

14th, fifth day.—The affection of the joints was still more marked.

17th, eighth day.—Pain in both wrists, and on the left side.

18th, ninth day.—Pains in both elbows, no pain in any other joint; skin hot and dry; respiration 48, pulse 120.

19th, tenth day.—Pain in both wrists; urine copious, lithates, sp. gr. 1035, acid and scanty; perspired freely.

20th, eleventh day.—Great pain in the region of the heart. Not much pain in her joints. Temperature 102·8, respiration 48, pulse 120.

22nd, thirteenth day.—Almost free from pain. Tempera-

ture 102·5, respiration 52, pulse 126. Urine 18 oz. in twenty-four hours, sp. gr. 1029, loaded with lithates. She continued much the same, the temperature a little over 102, the pulse about 114, and respiration about 40. One day free from pain, the next day pain in all her joints.

30th, twenty-first day.—In no pain; urine 20 oz. in twenty-four hours, sp. gr. 1020, with lithates, and her temperature had fallen to 98. She continued to improve.

February 2nd, twenty-fourth day.—Her temperature was normal, and had remained so since the 30th January. Urine 23 oz. in twenty-four hours, sp. gr. 1015. From this time she steadily improved, and was discharged cured.

On the twenty-first day of admission the acute symptoms are calculated to have ended. The total duration of the acute symptoms, including the four days before admission, was twenty-five days.

Condition of the heart.—On the day of admission there was no abnormal bruit, but the first sound was prolonged and very feeble. The cardiac dulness was normal. On the sixth day after admission, and two days after the rheumatic affection of the joints became well marked, a faint systolic bruit was heard all over the cardiac region, and the cardiac dulness was slightly increased. On the eighth day of admission the cardiac dulness was increased and a harsh to-and-fro murmur was heard over and about the apex of the heart. On the ninth day the cardiac dulness reached as high as the second interspace. The impulse was diffused all over the cardiac region, and a to-and-fro murmur was heard. On the eleventh day a faint to-and-fro murmur was heard all over the cardiac region. There was dulness. The tactile vocal fremitus was distinct. There were bronchophony, bronchial breathing and fine crepitation during deep inspirations over the lower portion of the left chest posteriorly. At this period there was well-marked pneumonia and pericarditis. On the thirteenth day the to-and-fro murmur was less distinct. The dulness, bronchial breathing, and bronchophony were very distinct over the lower part of left lung. On the fourteenth day the heart's sounds were normal. On the sixteenth day the

heart's sounds were normal, and the bronchial breathing and the bronchophony were not so distinct. On the seventeenth day the heart's sounds were normal, and the bronchial breathing and bronchophony were still heard. On the twentieth day of admission no abnormal sounds of the heart; coarse crepitation over the lower part of the left lung. On the twenty-first day the physical signs over the left lung were much less distinct, and they gradually disappeared. When this patient was discharged no abnormal sounds were heard over the region of the heart or lungs.

The acute symptoms terminated in these cases respectively on the 11th, 11th, 12th, 4th, 8th, 6th, 15th, 20th, 5th, 12th, 7th, 21st, and 3rd day. The average duration of the acute symptoms, therefore, in the thirteen cases was ten days.

In the first series of cases, under the care of Dr. Gull, treated for the most part with mint-water only, which we have published in vol. xi, 3rd series of 'Guy's Hospital Reports,' 1865, the average duration of the acute symptoms was 8·5 days.

In the second series, published in vol. xii, 3rd series of the 'Guy's Hospital Reports' of the year 1866, the average duration of the acute symptoms was 9 days.

And in this our third series of cases, as we have stated above, the average duration was 10 days.

There is, therefore, a difference of one day and a half only betwixt the three series of cases, the average of these three being 9·1 days.

This, we believe, will usually be found to be about the length of time that the acute symptoms generally extend over in cases of rheumatic fever, where there is no severe heart disease.

In the third series of cases, as we have just stated, the average duration of the acute symptoms was calculated at 10 days, whereas in our first series of cases it was 8·5 days. This difference may be explained when we state that much greater care was taken in estimating the duration of the acute symptoms in the third series of cases than in the first. In the third series the temperature was

taken every morning and evening, and until this was found to be normal the acute symptoms were not considered to have ceased. It not unfrequently happened that the tongue was clean and the patient was free from pain, but the temperature was higher than normal; in such cases, guided by the thermometer, we have concluded that the acute symptoms had not terminated. Whereas in the first and second series of cases, where the thermometer was not used, when the tongue was clean, the skin felt cool, and the patient was free from pain, the acute symptoms were regarded as having ceased. Had the temperature been taken in the first and second class of cases, we believe the average duration of the acute symptoms would have been about 10 days instead of 8·5 days.

The total duration of the acute symptoms, including the time that the patient was ill before coming into the hospital, was respectively 19, 15, 18, 9, 9, 14, 28, 31, 22, 10, 24, and 25 days, and the total duration of the acute symptoms—that is, from their commencement to their cessation—was, on an average, 19 days.

We now proceed to ask—Is the duration of rheumatic fever longer when it is treated on the expectant plan, or when it is treated by drugs? We very much regret that, owing to the arrangement of Dr. Dickinson's paper (*vide* Royal Medical and Chirurgical Society's 'Transactions,' vol. xlv, on "The Treatment of Rheumatic Fever,") we could not compare his cases with our own. In Dr. Garrod's cases (Royal Med. and Chir. Soc. 'Transactions,' vol. xxxviii), treated by large doses of alkali, the male patients were, on an average, in the hospital 6·2 days before the acute symptoms subsided, and females were 7·3 days before the acute symptoms subsided. The average of the two was 6·75 days.

In Dr. Herbert Davies' cases (*vide* 'London Hospital Reports,' vol. i), treated by blisters, the duration of the acute symptoms, while the patients were in the hospital, was, on an average, 8·4 days.

When, however, we take the thermometer as a guide, we find in Dr. Herbert·Davies' cases that, although the patients were free from pain, and the joint symptoms had also sub-

sided, on an average, in 8·4 days, yet the temperature of the body was not normal until, on an average, 9·5 days.

In Dr. G. Owen Rees' cases ('Guy's Hospital Reports,' vol. xii, 3rd series, 1866), treated by lemon-juice, the duration of the acute symptoms in the hospital was 6·8 days.

And under the expectant treatment the duration of the acute symptoms in the hospital was 9·1 days.

To give this evidence more briefly, under the full alkaline treatment the average duration was . 6·75 days.

Lemon-juice ditto . 6·8 „

Blister treatment ditto . 8·4 „

Expectant treatment ditto 9·1 „

There was, therefore, a difference of a little more than 2 days in favour of the full alkaline and lemon-juice treatment, and the average in the blister and expectant treatment was almost equal.

When, however, the duration of the acute symptoms was tested still more accurately by the aid of the thermometer, we find that under the blister treatment it was, on an average, 9·5, under the expectant treatment 10 days.

The total duration of the acute symptoms, including the time the patients were ill before and after going into the hospital, was—

Under the full alkaline treatment . 13·5 days.

Under the blister treatment (not estimating by aid of the thermometer) was . . 15·7 days.

When the acute symptoms were estimated by the thermometer the duration was (under the blister treatment) . . . . . 17·27 days.

Under the expectant treatment . . 19·0 days.

These differences are very slight, so much so that they appear to us to argue that one plan of treatment (as regards shortening the duration of the rheumatic process) has no great advantage over the other. Probably it will be admitted that no great importance should be attached to the fact that under one plan of treatment the duration of the acute symptoms was a day or two less, for every physician is well aware how difficult it is to fix the period when the

acute symptoms have just ceased, so as not to be a day before or after the time when they have really subsided; for patients differ very much in estimating their own pain, and we therefore have to deal with all the uncertainty of subjective symptoms. It can, perhaps, be readily understood that one practitioner might consider a patient had lost all his acute symptoms to-day, whilst another practitioner, guided by the fact that the tongue was almost though not quite clean, that the patient was practically although not absolutely free from pain in the joints, might consider that the acute symptoms had not quite subsided, and then allow another day or two to pass over before he decided that the acute symptoms had ceased. Bearing this in mind, it appears to us that we cannot attach much importance to this difference of one or two days.

We therefore submit that there is no evidence to show conclusively that alkalies, lemon-juice, or blisters, curtail the duration of the rheumatic process. And we agree with Dr. Barclay, when (*vide* his work on 'Gout and Rheumatism,' page 32), speaking of the administration of alkali in rheumatic fever, he states, "We are not yet in a position to say that it exercises any influence in curtailing the duration of the disease."

With respect to lemon-juice also, we are not satisfied that it has any such power.

We have witnessed the trial of Dr. Herbert Davies' blister treatment in a few cases which have occurred in Guy's Hospital, under the care of Dr. Wilks and the late Dr. Barlow, also in cases which have occurred in the London Hospital, and it has appeared to us to relieve very much the pain and sufferings of the patient in some cases, but it has not appeared to curtail the rheumatic process. We noticed that, although the temperature of the body fell during the application of the blisters, yet it did not immediately return to its normal standard. It remained higher than normal for some days after the pain had abated, nor in several cases did the tongue become clean, the appetite return, nor the urine fall in specific gravity, as usually happens when the rheumatic

process is really over. Moreover, Dr. Davies' cases do not show, when compared with those here recorded, any decided evidence in favour of the blister treatment beyond the fact that the blisters appear to have given much and speedy relief to the pain in the joints. We therefore regard the application of blisters as a valuable agent in relieving the sufferings of the patient, but we are unable to say that it curtails the duration of the rheumatic process.

Our cases appear to us to teach that the rheumatic process runs its course under the expectant plan as favorably as under the treatment by drugs.

While it has been admitted by those who advocate the treatment of rheumatic fever by alkalies, that large doses of such drugs do not curtail the duration of the disease, nor bring very great relief to the patient, yet it is stated, to quote the words of Dr. Barclay, "that it does most incontestably prevent inflammation of the heart," and he further states "that the proportion of heart ailments is very much reduced by the employment of the alkaline treatment."

We now propose to inquire what evidence there is to support this statement?

We may now pass on to show what was the state of the heart in those cases where there was well-marked disease of that organ. In thirteen of these twenty-five cases there were physical signs indicating organic disease of the heart, particulars of which may be briefly given as follows:—It may be noticed that in every one of these cases the heart was more or less organically diseased when the patient was admitted into the hospital. In five of these thirteen cases there were physical signs of pericarditis on admission, and in three of the five there was a mitral bruit when the patients were discharged from the hospital. In a fourth a systolic aortic bruit was heard, and in the fifth case the heart was healthy when the patient was discharged. In one patient the first sound was prolonged at the base on admission, subsequently pericarditis and pneumonia supervened, and the heart was healthy when the patient was discharged from the hospital. In three patients there was a mitral murmur

on admission and when discharged from the hospital. In one there was an aortic obstructive bruit on admission and when discharged. In one the cardiac dulness was normal; the first sound was prolonged at the base on admission, and a mitral bruit existed when the patient was discharged. In one case there was a systolic bruit at the base on admission, and at the apex when discharged. In one case the apex beat was unduly marked, and there was præcordial pain on the day after admission; a new-leather-creaking bruit subsequently developed itself, and the patient died.

Besides these cases, in which there was well-marked organic disease of the heart, there were twelve others in which there was no evidence of organic disease of the heart, but there was in nearly all more or less evidence of functional disturbance of this organ, or of changes in the blood producing so-called anæmic bruits. And in one or two cases the physical signs were such as might be said to indicate slight disease in the pericardium. These indications were, however, so slightly marked that it would be a matter of dispute as to whether they did or did not indicate morbid changes in the tissues of the heart. Not one of these patients had disease of the heart when discharged from the hospital.

The particulars of the twelve cases may be briefly summed up as follows:—In one case there was no bruit, but the heart's action was unduly marked. In one case there was a systolic, apparently an anæmic, bruit at the base on admission and when discharged. In one case the first sound was prolonged on the day of admission; on the seventh day a bruit was heard over the base, which afterwards entirely disappeared. In one the apex beat was unduly marked on admission, and on the third day a bruit was heard, and the heart was healthy when discharged. In three cases the cardiac dulness was somewhat increased, and a systolic bruit was heard over the base when admitted, but it was indistinct when the patient was discharged in one of the three cases, and there was a systolic bruit at the base on admission, and the heart was healthy when discharged, in two of the three cases. In

one case there was a systolic bruit at the base on admission, and the cardiac dulness was somewhat increased on the third day, and the heart was healthy when the patient was discharged. In one case a bruit was heard at the apex of the heart, which afterwards disappeared. In one a new-leather-creaking sound was heard, and the heart was healthy when discharged. In one the first sound was prolonged and the dulness increased on admission; afterwards a bruit was heard, and the heart was healthy when the patient was discharged. In one there was a bruit at the base on admission, and the first sound was prolonged when the patient was discharged from the hospital.

These details concerning the heart show that when rheumatic inflammation attacks the heart, and is allowed to run its natural course, the pericardium may become very extensively diseased, and yet the valves of the heart may escape, but in other cases in which there is pericarditis the valves may become diseased and rendered incompetent. Nor does it follow, because the pericarditis is severe and extensive, that the valves of the heart will certainly become diseased, but in the majority of cases in which there was severe pericarditis the valves did become involved.

Again, the cardiac dulness may be somewhat increased and extend higher than normal, and the first sound may be prolonged at the base. This prolonged first sound may develop into a bruit, and be followed by well-marked mitral disease. In other cases there may be a similar increase of cardiac dulness, and a new-leather-creaking sound may be heard at the base of the heart, and this may subside and the heart remain healthy. Further, a prolonged first sound may be heard over the base of the heart, and this may develop into a systolic bruit and afterwards entirely disappear, leaving the heart healthy. A slight bruit may be heard over the apex of the heart, and afterwards it may completely disappear and the heart remain healthy.

It is instructive to notice that there was more or less modification of the heart sounds during some period of the attack in every case except in one. In only one case did

the heart sounds remain perfectly healthy throughout the entire disease. But in eleven cases the abnormal sounds were such as are not usually considered to indicate any organic affection of that organ, and these abnormal sounds subsequently totally disappeared, and there was no evidence of cardiac disease when the patients were discharged from the hospital.

We now proceed to ask the question—If the heart was healthy when the patients were admitted into the hospital, was it common for it to become diseased while the patients were under treatment by mint-water in the hospital?

Our cases show that when patients free from heart affection were admitted into the hospital suffering from rheumatic fever, and the disease was allowed to run its natural course uninfluenced by drugs, it was a very rare thing for the heart to become diseased while the patients were under treatment in the hospital.

In only one case where the sounds of the heart were healthy on admission did the heart become organically diseased while the patient was under treatment. This was a peculiar case (*vide* Case 8, 'Guy's Hospital Reports,' vol. xii, 3rd series, p. 528), such a one as is very rarely met with. The peculiarity of this case was that the patient died suddenly and there was nothing found on post-mortem examination to account for her death, and the only evidence of heart disease was a very small quantity of recent lymph at the base of the heart.

The patient was a female, æt. 25, who was admitted into Guy's Hospital under the care of Dr. Wilks. When first admitted she was suffering a good deal; she was in great distress, very restless and anxious. She complained very much of distress about her chest, and when questioned as to whether she had any pain there she answered, "It feels so tight, I can hardly breathe." On the day of admission Dr. Sutton listened to her heart and heard no abnormal sound; two days afterwards a new-leather-creaking sound was heard over the base of the heart.

This case was such an exceptional one that it might be

fairly placed on one side, but even in this case there was some evidence of cardiac mischief within forty-eight hours after she was admitted into the hospital, as shown by the great distress the patient was suffering about the chest. And clinical experience has shown that severe distress and pain in the chest may be the first indication of pericarditis, and may precede the physical signs and exist without there being any physical signs to reveal the inflammation of the serous membrane.

In another case the indications of heart affection were very slight indeed when the patient was admitted into the hospital. A girl, æt. 16, was under the care of Dr. H. G. Sutton in the London Hospital (*vide* Case 13, Sarah B—, given in this paper). On the day of admission she stated that she had pain in her ankles, but she could stand and walk apparently without any difficulty, and there was no redness, tenderness, or swelling of the joints. The cardiac dulness was normal, but the first sound of the heart over the base was prolonged and feeble. There was no bruit. She had, she said, felt pain in her legs for four days before coming into the hospital. After she had been in the hospital two days the rheumatic symptoms developed themselves, and after five days the cardiac dulness was slightly raised and a systolic bruit was faintly heard all over the cardiac region. After six days the heart's action was rapid, the apex beat was unduly marked, and the systolic bruit was still heard. After seven days a to-and-fro murmur was heard over the base of the heart. From this time the pericarditis was well marked, and severe pneumonia also supervened. The patient had no evidence of heart disease when she left the hospital.

Unlike what usually happens with hospital patients suffering from rheumatic fever, the last-named patient was in the hospital from the commencement to the termination of her attack of rheumatic fever. When she was admitted the rheumatic process was so slightly marked that it was doubtful as to whether there was anything the matter with her. During the first two days that she was in the hospital there were no objective signs of rheumatic fever. After this time

the rheumatic process gradually developed, and the heart disease was developed simultaneously with the joint affection.

Ordinarily patients suffering from rheumatic fever do not enter the hospital until the disease has been going on some days, usually about six or eight days, and in a great number of cases the heart has already become diseased before entering the hospital. If, however, the patients were in the hospital at the commencement of the disease, we should probably more frequently observe the heart become diseased while they were under treatment. One patient, therefore, that was in the hospital from the first to the last of the rheumatic fever ought not to be compared with the cases that have suffered from rheumatic fever for some days before coming under observation.

Our cases of rheumatic fever therefore show that of twenty-five patients suffering from a first attack of this disease, twelve had organic affection of the heart on admission into the hospital.

In one patient who was in the hospital from the commencement of the attack there was some, but very doubtful, evidence of heart disease on admission into the hospital, and pericarditis supervened while under treatment. In another patient there were no physical signs of heart disease on admission, but there was great distress and pain in the chest. Forty-eight hours after admission there were indications of pericarditis in this case. In eleven cases there was no organic disease of the heart on admission, and none supervened while the patients were under treatment.

Our cases further show that where there was no evidence of organic disease of the heart on admission into the hospital, the heart was free from all evidence of disease when the patients were discharged from the hospital. Not one of our patients came into the hospital without heart disease and left the hospital with evidence showing that the heart was diseased.

The experience gained in these cases of rheumatic fever which were allowed to run their natural course uninfluenced by drugs tends to prove that, if patients are admitted into

the hospital suffering from a first attack of rheumatic fever, and the heart is not diseased on admission, it will very rarely become organically diseased while the patient is under treatment.

It is rare for the heart to become diseased when the disease is allowed to run its course uninfluenced by drugs, and, judging from the evidence before the profession, it is also rare for the heart to become diseased when rheumatic fever is treated by drugs.

In support of the latter statement we may be permitted to bring forward the following evidence :—Dr. Garrod, speaking of the alkali treatment in rheumatic fever (*vide* Royal Medical and Chirurgical Society's 'Transactions,' vol. xxxviii, p. 151) says, "I cannot help thinking that an effect is likewise produced on the cardiac disease to a very considerable and important extent." In no case did the affection of the heart ensue after the patient had been more than forty-eight hours under the influence of medicine.

The statistics of Dr. Dickinson (*vide* Med. and Chir. Soc. 'Trans.,' vol. xlv, p. 350) show that in forty-eight patients subject to the full alkaline treatment only one had pericarditis commencing after treatment had begun.

Dr. Herbert Davies, speaking of the treatment of rheumatic fever by blisters (*vide* 'London Hospital Reports,' vol. i, p. 300), says, "In no case where the heart was sound at the time of admission did any organic lesion subsequently develop itself."

Dr. G. O. Rees also has informed us that when cases of rheumatic fever were treated with lemon-juice it was exceedingly rare to find the heart become diseased during treatment, provided it was healthy when the patient was admitted into the hospital.

Dr. Basham, in his paper on "The Treatment of Rheumatic Fever by Nitrate of Potash" (Med. and Chir. Soc. 'Trans.,' vol. xxxi, p. 14) gives, in a tabular form, an account of seventy-nine cases of this disease. One of these cases was probably not rheumatic fever, making the number seventy-eight cases, all of which were treated by nitrate of potash.

In sixty-one cases there was no heart disease. In twelve cases there was no heart disease on admission, and in only five cases did the heart become diseased while under treatment.

The experience, therefore, of these several physicians in cases of rheumatic fever is, that it is rare for the heart to become affected while patients are under treatment in the hospital; that in nearly all the cases where there was heart disease it had commenced before the patient was admitted into the hospital.

It is difficult to understand how remedies so different in their nature and in their actions should all work in such a manner as to bring about the same result—how the administration of large doses of alkali should produce the same result as the application of blisters to the joints.

It may be said that the operation of alkalies, lemon-juice, and blisters, are different, but that they all accomplish the same end by either neutralising or eliminating the poison or the materies morbi of rheumatic fever. But can we reason in this way without begging the question? For it is not proved that there is a poison or materies morbi to be either eliminated or neutralised, and if we propose a theory to explain how these different remedies destroy the theoretical materies morbi it appears to us that we are only making a theory to explain a theory.

Seeing, therefore, that the heart rarely became affected when the rheumatic fever was not treated by drugs, we are compelled to ask the question—What evidence is there to show that any of the different plans of treatment which are advocated have any decided power in preventing the heart becoming diseased?

It appears to us that there is not sufficient evidence to prove that any of the systems of treatment have power to prevent the heart becoming diseased; and in concluding that the treatment has prevented the heart becoming diseased, physicians have overlooked the fact that there might be no tendency at the time that the patients were under treatment for the heart to become diseased, and our cases show that the good results which have been attributed to the influence of

the remedies also occurred when no special remedies were used.

Our cases, therefore, tend to teach that these good results were due, not to the drugs, but to the natural course of the disease.

Before we conclude that it was something connected with the natural course of the disease which prevented the heart becoming diseased while the patients were under treatment in the hospital, it is necessary to ask, was there not something common to all these different plans of cure which prevented the heart becoming diseased, and was this something not present in the blister, in the alkali, the acid, and in the expectant plan of treatment?

The only things, perhaps, which were common to all these modes of treatment were rest and regulated diet.

Then the question arises—Are rest and regulated diet sufficient to explain this immunity from heart disease? It appears to us that they are not sufficient. For patients suffering from a primary attack of rheumatic fever have had well-marked symptoms of that disease for some days before coming into the hospital, and the heart has been organically diseased on admission, yet these patients have rested and lain in bed some days and even weeks before entering the hospital. Again, other patients have not rested while they were suffering pain in their joints and had other symptoms of rheumatic fever, and yet on admission into the hospital with a primary attack of rheumatic fever the heart has been found to be free from disease.

It would appear, therefore, that rest and regulated diet are not alone sufficient to explain why the heart rarely becomes affected when the patients are under treatment in the hospital.

We shall now pass on to point out evidence which tends to show that when the heart becomes diseased in rheumatic fever it does so at an early stage of the disease, and if the heart does not become diseased during the first week of the rheumatic fever it rarely does so afterwards.

In order to do this it is necessary to show, when patients labouring under a primary attack of rheumatic fever were

admitted into the hospital with heart disease, that such disease had set in during the first week of the fever.

We now beg to bring forward brief particulars of cases which show that the heart becomes involved during the early part of the attack.

In the case of a female, æt. 16 (*vide* Case 13 recorded in this paper), admitted into the London Hospital January 10th, 1867, four days previous to admission she had some pain in her ankles. During the first and second days of admission there were no decided rheumatic symptoms; she said her ankles were painful, but she could move freely in bed and could stand and walk about. Her tongue was clean, her skin cool, and it was very doubtful whether there were any indications of approaching rheumatic fever. Respecting the heart, there was no bruit, but the first sound was prolonged and feeble. The cardiac dulness was normal. On the third and fourth days of admission there were more decided rheumatic symptoms, pain in the left wrist and right ankle. On the fifth day the prolonged first sound mentioned above was found to have developed into a systolic bruit; this was heard all over the cardiac region. The cardiac dulness was slightly increased. On the eighth day of admission, and five days after the rheumatic symptoms were well marked, the systolic bruit was replaced by a harsh to-and-fro murmur, and the cardiac dulness was increased.

The second case was that of a female, æt. 18 (*vide* Case 5 recorded in this paper), who was admitted into the London Hospital January 28th, 1868. This was her first attack of rheumatic fever. Two days before admission she did not feel quite well, but there were no decided rheumatic symptoms until the day before she entered the hospital. On the second day of the rheumatic attack there was evidence showing that the heart was involved. The cardiac dulness reached as high as the third rib, and there was diminished resonance as high as the second rib.

The visible impulse was unduly marked over the third interspace close to the sternum; the first sound was prolonged and almost equal to a bruit, also prolonged over the apex.

On the fifth day of admission the prolonged first sound resembled a faint bruit. On the sixth day it had become developed into a marked bruit, which was audible both over the base and apex of the heart; this murmur subsequently became developed into a well-marked mitral bruit, which was present when she left the hospital.

In a third case, a female, æt. 14 (*vide* Case 11 in this paper) was admitted into the London Hospital October 25th, 1868. This was her first attack of rheumatic fever, and she stated that she had never been ill before. The rheumatic symptoms appeared three days before admission. October 26th, the second day of admission and fifth of the rheumatic process, there was evidence showing that the heart was involved. The heart's impulse was diffused and visible in the second and third interspace; the cardiac dulness reached as high as the second costal cartilage and as low as the sixth rib; a well-marked, apparently an aortic, systolic bruit was heard over the second interspace; this murmur was heard when the patient was discharged from the hospital.

The fourth case,[1] a patient under the care of Dr. Andrew Clark in the London Hospital, was a female, æt. 20, who was admitted into the hospital March 2nd, 1868. She stated that this was her first attack of rheumatic fever; that she was well three days before admission. Two days before admission she was taken with pain in the left ankle, which extended the following day into the opposite ankle. She was admitted into the hospital two days after the rheumatic symptoms first appeared, that is, on the third day of seizure, and there was, at that time, proof of the heart being involved. A systolic mitral bruit was heard at the apex of the heart, which continued and was distinctly heard on the twenty-third day of admission.

The fifth case, a female, æt. 18 (*vide* Case 7, 'Guy's Hospital Reports,' vol. xii, 3rd series, p. 525), was admitted into Guy's Hospital December 20th. The rheumatic process commenced five days before entering the hospital. On the day of admission a bruit-de-cuir-neuf was heard over the

[1] This case is not reported in the paper.

base of the heart, and subsequently a decided systolic bruit became developed.

In a sixth case, a male, æt. 23 (*vide* Case 3 in the same number of 'Guy's Hospital Reports,' p. 515), was admitted into Guy's Hospital November 3rd. It was his first attack of rheumatic fever. On the seventh day of the rheumatic process there was a systolic mitral bruit at the apex of the heart, which persisted and remained when the patient was discharged from the hospital.

Referring back to these six cases, we find that two patients were admitted two days after the rheumatic process commenced, one three days afterwards, one four days, another five days, and lastly one seven days after the rheumatic process set in. In all these six cases there were physical signs showing that the heart was involved.

Of twenty-two patients[1] suffering from a first attack of rheumatic fever, thirteen came into the hospital during the first week of the disease. In one patient the rheumatic fever had commenced five days before admission into the hospital, in another six days before admission, in a third three days before admission, and in the remaining cases the disease had been going on five, six, five, four, five, six, one, six, three, five days before the patient entered the hospital. The remaining nine of the twenty-two patients had been ill longer than a week when they were admitted into the hospital.

Every one of these thirteen patients on the day of admission into the hospital was found to have organic disease of the heart, and the heart disease had commenced before the patients entered the hospital. In these cases, therefore, the heart must have become diseased before the second, third, fourth, or fifth day of the rheumatic fever; in all these cases the heart was diseased before the patient had suffered from rheumatic fever a week.

[1] Many of these are our own cases reported in vols. xi and xii of the 'Guy's Hospital Reports,' 3rd series. Others taken from Dr. Garrod's cases (*vide* Royal Med.-Chir. Soc. 'Trans.,' vol. xxxviii). These twenty-two patients have been selected simply because they were suffering from a primary attack of rheumatic fever and the heart was diseased on their admission into the hospital.

It appears to us, therefore, that these cases prove that in rheumatic fever the heart is very liable to become diseased during the early stage of that disease, and that it very frequently does become diseased during the first week of the malady.

Further, two cases showed that the heart had become diseased as early as the third day, and in one case that it had become diseased two days after the rheumatic process had set in.

Having shown that the heart frequently becomes diseased during the first week of the rheumatic fever, we now proceed to inquire if it is common for it to become diseased during the second, third, or subsequent week of rheumatism.

To prove that a patient who has escaped heart affection in the first week of rheumatic fever is not liable under any circumstances to suffer from heart disease in the second or subsequent weeks would require a very large experience, and such an opinion ought to be supported by a very large number of cases. A few cases may, however, be sufficient to show that there is no great tendency for the heart to become diseased during the second and later weeks of rheumatic fever.

We have particulars of twelve cases of well-marked rheumatic fever, seven of which occurred in the London and five in Guy's Hospital. In not one of these cases was there any organic disease of the heart when the patients entered the hospital; eight of these twelve cases entered the hospital during the first week of the rheumatic fever. Four of them entered the hospital five days after the rheumatic symptoms first appeared, two six days after, one four days, and one three days after. The remaining four of the twelve cases did not enter the hospital until after the rheumatic fever had been going on eight, eight, twelve, and twenty-one days respectively.

These eight patients were placed under the mint-water treatment; the rheumatic fever was, therefore, allowed to run its natural course.

All these patients were admitted into the hospital during the first week of the fever free from organic disease of the

heart, and while they were under treatment during the second and subsequent weeks of the seizure no heart disease came on. In not one instance did the patient escape heart disease during the first week of the rheumatic fever and contract such disease during the second or later weeks of the fever.

If the heart were not diseased in the first week it did not become diseased in the second or in the later weeks of the rheumatic fever.

It will be instructive now to inquire if what we have stated respecting the heart becoming diseased in the first and not in the second week of rheumatic fever in anyway explains why the heart did not become diseased when patients were in the hospital and treated by alkalies, lemon-juice, blisters, or by the expectant plan.

The explanation would, according to what we have shown, appear to be that patients suffering from rheumatic fever are not, as a rule, admitted into the hospital until the period when the heart is liable to become diseased has passed over. Experience teaches that the heart becomes diseased at the very outset of the rheumatic fever, before the patients enter the hospital, and if the patients pass the first few days of the rheumatic fever without the heart becoming involved then they do not contract heart disease during the later part of the rheumatic attack.

Some patients treated by mint-water entered the hospital as early as the third, fourth, and fifth day of the rheumatic fever without any heart disease, and the heart did not become diseased while the patients were under treatment.

Some patients treated by blisters or by alkalies, entered the hospital as early as the third, fourth, and fifth day, without any heart disease, and the heart did not become diseased while the patients were under treatment. The same thing occurred, therefore, when the disease was allowed to run its natural course as occurred when the disease was treated by blisters or alkalies.

In our cases treated by mint-water the rheumatic fever commenced, on an average, eight days before the patients entered the hospital.

In Dr. Herbert Davies' cases treated by blisters, the rheumatic fever commenced, on an average, 7·9 days before the patients entered the hospital.

In Dr. Garrod's cases treated by alkali, the rheumatic fever commenced, on an average, about eight days before the patients entered the hospital.

So that Dr. Davies', Dr. Garrod's, and our own cases entered the hospital, on an average, about eight days after the rheumatic fever had commenced—that is, in the early part of the second week of the rheumatic fever. And the same thing was observed in Dr. Davies', Dr. Garrod's, and in our own cases, that if the patient's heart had not become diseased in the first week of the rheumatic fever, that is, before coming into the hospital, it was very rare for it to become diseased during the second or later weeks of the rheumatic fever while the patients were under treatment in the hospital.

However much influence we may consider that the blisters or alkalies had, in preventing the heart becoming diseased, this fallacy was avoided in our own cases, for no drugs having any influence were used; and as the same result followed when drugs were not given as when they were given, it is difficult indeed, to believe that the drugs were the means of preventing the heart becoming diseased.

We therefore respectfully submit, that the reason why the heart did not become diseased when patients were treated by blisters or by alkalies, was that the patients were not placed under the treatment until the period when the heart was liable to become diseased had passed over. For there is evidence tending to show that it is part of the natural course of rheumatic fever for the heart to become diseased during the first few days of the fever, and if it does not then become diseased it rarely does so in the second, third, or later weeks of the rheumatic fever.

We would here venture to observe that in acute rheumatism care is requisite in determining during the first week, whether the heart is really diseased or not. Some physicians have considered that an unduly-marked apex-beat, or an excited or an irregular action of the heart, indicated in rheumatic

fever, that the heart was becoming diseased. In some cases, there may be no auscultatory signs to show that the pericardium is becoming involved, but there may be great præcordial pain, and sometimes pain between the shoulders, and these symptoms precede the auscultatory signs some hours or a day or two.

In the commencement of the heart disease, there may be no loud bruit, but merely a prolonged first sound, or a slightly-marked new-leather creaking bruit over the base of the heart. Both these sounds may be very easily overlooked, and yet experience shows that such a prolonged first sound, not unfrequently in the course of a few days, becomes a well-marked mitral bruit, and the new leather creaking bruit becomes a well-marked to and fro pericardial bruit. It also occasionally happens that the first sound is prolonged at the apex and continues so until the patient is almost, if not, actually convalescent, and then this prolonged sound becomes a decided mitral murmur.

In bringing this paper to a close, we beg leave to thank the members of the Society for their kind attention, and venture to hope that these cases, few as they are, may be found not only interesting, but also instructive. We also beg to thank Mr. George Mackenzie, and Mr. McCarthy, of the London Hospital, who have greatly assisted Dr. Sutton in recording the cases.

We may now briefly sum up the various conclusions arrived at in this paper as follows:—

1. That rheumatic fever uncomplicated with any very severe heart affection tends to run its course in nineteen days, calculating from the time the rheumatic symptoms first set in to their termination.

2. That the average duration of the acute symptoms while patients were in the hospital and free from very severe heart complications was nine days.

3. That in nearly all the cases referred to in this paper, there was some modification of the heart's sounds during some period of the rheumatic attack.

4. That severe pericarditis complicated with pneumonia

may subside and leave the heart healthy, so far as we can test by our present means, without the aid of any drugs.

5. That when the heart was healthy on admission into the hospital, it was very rare for it to become organically diseased while the patients were under treatment by mint water, or, in other words, when the rheumatic fever was allowed to run its natural course.

6. That the evidence before the profession shows that the heart very rarely became diseased while the patients were under treatment (in the hospitals). And that this was the case when the patients were treated by alkalies, lemon juice, or by blisters to the joints.

7. That there is not sufficient evidence before the profession, to prove that any of the advocated remedies have power to prevent the heart becoming diseased.

8. That in concluding that the treatment has prevented the heart becoming diseased, we have overlooked the fact that there might be no tendency at the time the patients were under treatment for the heart to become diseased.

9. That in rheumatic fever the tendency is for the heart to become diseased during the first few days of the fever, and should it escape the early days of the disease, there is each day a lessening tendency to its implication; hence, our cases would appear to show that if at the end of the first week of the rheumatic fever the heart is free from disease, there is little or no tendency for it to become diseased during the later weeks, provided patients are treated by rest and regulated diet.

10. That the reason why the heart did not become diseased when rheumatic fever was treated by alkalies or blisters to the joints is to be attributed not to the influence of the drugs but to the natural course of the disease. For the patients did not come under treatment, until the rheumatic fever had been going on some days, and until the period when the heart was most liable to become diseased had passed over.

We ought not to conclude the paper without expressing our convictions that, hitherto the investigation into the therapeutics of the rheumatic process have been rendered all

but valueless by the deficiency in preliminary data. There are as yet no reliable facts in the pathology of the process; we are ignorant of the essential state of which the rheumatic symptoms are an expression.

At present, therefore, as regards treatment, our cases seem to show that we are limited to a careful regimen of the patient. Rest, mechanical and physiological. Rest in the very outset of the disease. We ought not to wait until the rheumatic process has become well developed in the joints. For it appears to us that the heart becomes involved simultaneously with the joints, and by rest we hope to quiet the heart's action, and so prevent it becoming diseased.

To regulate the temperature. To moderate excessive skin function by sponging the surface of the body with tepid water. To allay pain by placing the patient in an easy position, and sometimes by opiates. To sustain the organic nerve power by light diet, and occasionally by small doses of alcohol. To procure rest by the simplest means, especially avoiding such movements of the body as may excite the circulation. In fine, to place the patient in a physiological state of mean rest, if it may be so expressed, of the nervous, the circulatory, the muscular, and the digestive systems.

To do this fully will tax often all our energies, and we should not be just to ourselves if we did not here say that to attain this has been the object of our greatest care. It required often more consideration than was requisite for prescribing any supposed appropriate drug treatment. We are therefore, at present, advocates of the exactest treatment of the patient under acute rheumatism, though we may doubt the value of so-called specific drugs.

ON

FISSION AND EXTROVERSION OF THE BLADDER WITH EPISPADIAS;

WITH THE RESULTS OF

EIGHT CASES TREATED BY PLASTIC OPERATIONS.

BY

JOHN WOOD, F.R.C.S.

Received Dec. 9th, 1868.—Read Feb. 9th, 1869.

The unfortunate subjects of this deformity are more numerous than is, perhaps, generally supposed. The author has himself met with more than twenty instances. A great number have been placed on record by various writers on Teratology, and many have lately been treated by surgeons in this metropolis and elsewhere. Being in its more commonly observed degree perfectly consistent with continued viability, it becomes a matter of serious moment whether or no the various resources of plastic surgery can be applied to relieve the sufferings and discomfort of so deplorable a condition. Too often helplessness and disgust have blunted the feeling and stayed the hand of active sympathy in dealing with these unhappy objects. Not unfrequently they live to a good age, and even to old age. Flajani described a case in a person aged 70 ('Malatti spettanti alla Chirurg.,' 1786),

Quatrefages described two cases in persons aged 46 and 49 respectively. In a case described by Mayo, of Winchester (a cast of which, with the dry preparation of the pelvis, was placed in the Hunterian Museum), the patient, a female, had reached an age of between fifty and sixty. The deformity seems to be much more common in the male than in the female. It is not rare, however, in the female; Benjamin Phillips collected notes of twenty-one examples.[1] Only two out of the twenty seen by the author were of the latter sex. In this sex, also, it is not incompatible even with procreation. Cases of pregnancy in women subject to this deformity are described by Huxham, Oliver, and Bonnet, in the 'Philosophical Transactions,' vol. xxiii, p. 408, and vol. xxxiii, p. 142. In a similar case described by Thiebault, delivery of the child by the perinæum occurred; parturition had also occurred in the female operated on by Dr. Ayres, of New York, in 1858. Such a capability for life, its continuation, and its special procreative functions, enhance the importance of the measures for the relief of this deformity described in the present paper, and increase, if that be needed, the interest of the surgeon in, and his motive for, undertaking its treatment.

The majority of the cases of the deformity under consideration present an appearance sufficiently remarkable for its uniformity. From the time of birth a vividly red prominence of smooth mucous membrane, of varying size, and secreting profusely a slimy discharge, is found to occupy that part of the abdominal wall which lies in the median line below the umbilicus. Sometimes its villous and vascular surface resembles so much a tumour of a nævoid or malignant nature that it has been repeatedly mistaken for such, and in one reported case was about to be excised. When the diaphragm and abdominal muscles are brought forcibly into action the tumour suddenly enlarges in the manner of a hernia, and on being manipulated it is found to cover and invest the intestines, which form the bulk of the tumour, and can be pressed out of it with the peculiar feel, and sometimes the

[1] Todd's 'Encyclop. of Anat. and Physiology,' vol. i, p. 391.

gurgling, of a hernial protrusion. Around its margin are traces, more or less distinct, of a smooth, white, and shiny cicatrix, which, blending with and obscuring almost wholly, in most cases, the normal umbilical mark, passes down on each side as far as the genital organs.

Lying in an arched horizontal groove or chink at the lower part of the tumour and, in the male sex, usually covered and protected by the root of the penis, may be seen the papillary openings of the ureters, through which the urine constantly exudes drop by drop; and sometimes, when pressure is applied over these ducts, a small squirt of urine can be made to pass out. Below these may be seen the smooth triangular surface of the trigone. On each side of the base of the tumour at its lower part a thick, bony prominence can be distinctly felt. These are the symphysial surfaces of the pubic bones, widely separated from each other. In the adult the distance between them amounts frequently to four inches or more. In all the instances seen by the author, and in all the recorded cases, an *epispadiac* or split condition of the *urethra* has been found to coexist. In one case, however, recorded by Baillie, and quoted by Vrolik in Art. Teratology (Todd's 'Encyclopædia,' vol. iv, p. 952), the anterior part of the urethra only was epispadiac, the hinder portion being completely closed in. The channel or groove of the open urethra presents, in the male, the *caput gallinaginis* and *sinus pocularis*, with the slit-like openings of the ejaculatory ducts. Most of the usual markings and follicles of the urethral canal are present, though the whole structure of the penis is shortened and stunted in its development, and laid with its upper surface flat against the bladder. The *glans penis* is bilobed, with the urethral groove separating the lobes above. The *frænum præputii* is usually large and well developed, and is connected below with a large fold of præputial skin, presenting a sort of dewlap. The scrotum is usually round and infantine in shape, but broad and abundant; it often contains well-formed testes, but these may be found in many cases lying in the coverings of the cord, above the scrotum; or they may be lodged in the inguinal canal. Frequently one or both groins are affected

with congenital hernia, apparently from the lax condition of the structures forming the inguinal apertures and canal. In some cases small hernial protrusions are also found in the attenuated cicatrix which borders upon the extroverted bladder. These seem to be more common in cases which have attained to adult age.

In the female sex the *clitoris* and anterior *fourchette* are completely divided into two parts, attached to the corresponding *nymphæ*. This is analogous to the separation of the *corpora cavernosa* in the male, and the division resulting from the absence of the *corpus spongiosum* as a connecting bond between them. The orifices of the ureters thus become more exposed externally in this sex than in the male, and the bladder and urethra seem to open directly into the vagina, at the upper end of which can usually be seen a properly formed *os* and *cervix uteri*.

In the dissection of the parts affected by this deformity in two cases, both young, one male and the other female, the author found the pubic bones widely separated from each other, but otherwise preserving their normal outline and completing the obturator foramen as in the normal bone. The foramen, however, as well as the angle of the pubis and its crest, are narrower than usual. In the male was found a strong fascial membrane extending from one pubis to the other below and behind the urethra, and evidently constituted by the lower part or base of the triangular ligament of the urethra. This supported firmly the base of the bladder and penis. In the female, no structure whatever of this kind existed. No trace, of course, existed of the pubic symphysis, or sub-pubic ligament, or any of the structures placed above and in front of the normal urethra. The crura of the penis, connected as usual with the united *ischio-pubic rami*, passed upwards and inwards to become united together by an erectile structure which seemed to represent the *corpus spongiosum*, and this was connected anteriorly with the *glans penis*. The prostate was separated from the spongy portion of the urethra by the transverse inter-pubic ligament, representing the base of the triangular ligament of the urethra,

but no distinct membranous urethra could be defined, nor was there any trace of the *compressores*, or deep transverse perineal muscles. The rest of the perineal structures were normal, the downward limit of the abnormality being apparently the lower wall of the urethra itself.

The *recti abdominis* muscles were separated from each other at the lower part to the whole width of the divergent pubes and extroverted bladder. The sheath which enveloped them was united to the edges of the exposed vesical mucous membrane and to the skin of the abdomen, by a dense and extremely tough and resisting cicatrix before alluded to. The separation of the *recti* extended more or less up to the points of their insertion into the thorax—the median interval being filled up by a lateral extension of the tissues composing the "linea alba" above the navel. No proper navel or umbilical depression was found. This structure is said by B. Phillips, however, in the article before quoted, to be usually present in these cases. It was not found in a case, the dissection of which is described by Professor Humphry, of Cambridge, in the last number (November, 1868) of the 'Journal of Anatomy and Physiology.' Both the hypogastric cords were found in the cases examined by the author as well as in that described by Humphry. Occasionally, one of these arteries has been found wanting in these cases, and, from one such instance, Serres concluded that this absence stood in the relation of cause to the malformation. Vrolik and Mende, however, give instances in which an absence of one of the hypogastric or umbilical arteries was observed in children, otherwise perfectly developed as to the bladder. No trace of the obliterated urachus was found, in the cases examined by the author, under that portion of the peritoneum which passes from the back of the bladder to the abdominal wall. Professor Humphry has called attention to the curious change in the curves of the sacrum induced by the separation of the pubic part of the pelvic girdle. Both the transverse and vertical curves of this bone at its upper part were rendered convex instead of concave; while the iliac shafts were shortened, their tuberosities and posterior spines

approximated behind, and the sacro-sciatic notch very much narrowed (op. cit., 2nd series, No. III, p. 84, and Plate III). The effect of this is to resist the inward pressure of the legs more efficiently in the weakened condition of the front part of the pelvic circle. The kidneys, ureters, and *vasa deferentia*, were normal in the cases dissected by the author, both of which were in young children. In some of the adult cases observed during life, however, some dilatation of the lower part of the ureters was proved to exist by an occasional accumulation of urine in one or both, marked by an enlargement just above the papillary orifice, from which it escaped in a squirt or gush when the swelling was pressed by the fingers. Humphry found the kidneys and ureters normal, the vasa deferentia slightly dilated, and the vesiculæ seminales absent, in a young man affected by the deformity.

In all the cases seen by the author the anus was placed rather in front of its usual position, and in many with a slightly anterior instead of a posterior direction. The thighs are also placed somewhat more widely apart than normal, rendering the gait straddling, waddling, and woman-like, in the male sex. The body is usually carried with a considerable stoop forwards, as if shrinking from contact with the dress at the malformed part. The other parts of the frame are usually formed on a delicate scale, and the unfortunate patients are not uncommonly in feeble health; and frequently, when exposed near the time of puberty to the jeers of their playfellows, or to the tormenting consciousness of their physical deficiency in the region which usually occupies so important a consideration in the thoughts at that time of life, are rendered fretful, irritable, capricious, and extravagant in temper. Many exceptions to this are, however, met with, and in several cases on record the experiment of matrimony, or coition without that sanction, has been attained to.

There are various degrees of deficiency in the hypogastric region recorded by writers on Teratology. The abdominal walls may be imperfectly closed in without the bladder being fissured, a condition to which the term "*Ectopia vesicæ*," is confined by W. Vrolik. In this form the navel is usually

complete. The urachus on the one hand, or the urethra on the other, may alone be more or less fissured; the latter condition being well known by the terms *epispadias* and *hypospadias*. These are cases in which an arrest of development has occurred at a *later* period of development.

Vrolik and Martels ('Archiv für Anat.,' 1868, p. 165) give cases in which the mucous membrane of the bladder itself was separated by a median cicatrix into two lateral halves. In the case of this kind, figured by the former in Todd's 'Encyclopædia' (vol. iv, p. 951), the child lived twenty-two days only; the anus or bowel opened *above* the split penis between the two halves of the bladder, while a tail-like growth occupied its normal situation. In other cases the bowel opens into the vagina, or even into the urethra, the anus being imperforate—the "*atresia ani urethralis*" of Pappendorf. These are evidently cases in which the arrest of development has taken place at an earlier period, while the fœtus still presents a cloacal formation. These subjects can scarcely be considered as viable for any considerable time or practical purpose, although Bartholin records a most extraordinary case in which there was neither penis nor anus, and all the *ingesta* returned by the mouth during forty years ('Hist. Anat.,' iv, 30, p. 293). Of the same character is the case of a female child recorded by the editor of Todd's 'Encyclopædia' (in a note at the foot of p. 390), in which the ureters opened into two separate small sacs placed one on each side of the pubic region, the anus being imperforate. In a case described by Richardson in the 'Philosophical Transactions' (vol. 7), occurring in a lad aged 17, the ureters opened directly into the rectum. The lad suffered from a constant diarrhœa and irritation induced by the passage of the urine into the bowel. This case is interesting in a practical point of view from its bearing upon the method proposed and practised by Mr. Simon and Mr. Lloyd for making an artificial communication between the bladder and rectum in these cases.

In such cases of entire deficiency of the bladder the ureters may open directly into the urethra; as in the case of a man,

aged 35, described by Lieutaud ('Hist. Anat. Med.,' lib. i), and another case of an adult by Binninger ('Obs. Med.,' 24, 2); or the ureters may open into the vagina,—as recorded by Haller ('Elem. Physiologiæ,' vol. vii, p. 299).

As to the cause of the deformity under consideration the views of writers differ considerably. Bonn and Duncan ('Edin. Med. and Surg. Journal,' 1805) adopted an entirely mechanical view, considering the deficiency to be caused by absolute bursting of the fœtal bladder from over-distension, by accumulation of its contents at an early period, while the abdominal walls are still in an incomplete or attenuated condition, and the pubic symphysis as yet ununited.

Velpeau ('Mem. de l'Acad. Royale de Médecine,' T. iii); followed by B. Phillips ('Todd's Encyclopedia of Anatomy and Physiology,' vol. i, p. 392) considered that it was due to *ulceration* of the abdominal walls and bladder, between the second and third months of intra-uterine life, when the tissues at this point are very thin. In a fœtus of three months, Phillips found an opening in the hypogastric region with jagged, thin, and unequal edges, as if from a perforation. This author also states that the pubic bones are not merely separated, but commonly destroyed. This has certainly not been the case in any of the specimens examined by the author, nor is it stated by any other writer. The appearance of cicatrization, abundantly evident around the extroverted parts, at first sight seem to support the theory of ulceration; but when we remember that such appearances are very common in hare-lip and thoracic and other congenital fissures, universally admitted to be caused by an arrest of development, the support derived from this fact falls to the ground.

M. Vrolik, in the article before quoted, adduces many good reasons in favour of the theory that the deformity arises from an arrest in the development of the bladder and urachus from the fœtal *allantois*. One of the strongest arguments is drawn by him from the analogy of other fissures of a congenital character in the median line, such as fissured vertebræ or *spina bifida*, cleft palate, fissured thorax from deficiency of the sternum with *ectopia cordis*, and simple

fistulous urachus and *epi-* or *hypospadias*, which could not, by any possibility, have originated from such a cause. Some of these also sometimes, and one (*epispadias*) always, coexist with the extroverted bladder. In one case (that of Baillie's already mentioned) the coexistent *epispadias* was confined to the extreme end of the urethra, and did not extend up to the fissured bladder.

In an ovum, described and figured by Coste, belonging to the second period of development, (between the tenth and twentieth days after conception); and in another from Wagner of about the twenty-first day, both given in Baly's translation of Müller's 'Physiology' (vol. ii, figs. 220 and 222), the *allantois* sac is found just as it begins to be attached to the *chorion* to form the umbilical cord. Its outer or amnionic layer (vascular layer of Von Baer, in which are afterwards developed the umbilical arteries, and which forms the sheath of the funis) is seen in both these specimens to be continuous with the edges of the fissure in the yet imperfectly closed abdominal wall. In the inside of this is an inner cylindrical portion (constituting the mucous layer of Von Baer) which is prolonged down into the pelvic cavity, where it is continuous with the end of the intestine, and is connected with the lower part of the Wolffian body, from which it seems to be originally developed. This union with the intestine afterwards forms the common cloacal cavity, persistent in some of the lower animals, which, according to Tiedemann, opens externally about the fifth or sixth week. By arrest of development at this stage originate those extreme cases of the deformity, before alluded to, in which the bowel opens upon the exposed bladder or urethra, or the ureters open into the rectum. In the normal course of development the rectum and anus become separated from the ducts of the urinary and genital organs, and a common "*sinus urogenitalis*" is then found, into which open the Wolffian ducts, the ureters, and the efferent ducts of the generative apparatus. From this is afterwards differentiated the bladder, urachus, and urethra, on the one hand; and the prostate and its appendages, or the uterus and vagina, on the other.

If, about this period of gestation, by inflammatory change, or adhesion, or some degenerative process arising from one of those specific diseases, such as syphilis, to which we know the fœtus *in utero* to be liable, the normal progress is arrested in the outer abdominal or amnionic layer of the allantois, without affecting the inner or mucous layer, the result at time of birth would be the formation of the deformity termed by Vrolik "*Ectopia vesicæ*;" *i. e.* a fissure of the hypogastric wall only, with a completed condition of the walls of the bladder itself. But if the morbid process extends also to the subjacent portions of the internal cylinder or mucous layer of the *allantois*, then, according to the position or extent of the abnormal change, the result would be a more or less extreme degree of *epispadias*, an open or imperfect urachus, or a completely fissured and extroverted bladder, with separation of the pubic bones and the other changes associated with that deformity.

An important observation has been made in these cases, that, at the time of birth, the hypogastric surface of the fœtus, from the umbilicus to the genital organs, is usually found to be adherent to the placenta or its membranes, the adhesions becoming separated by the process of parturition at the parts in which the cicatrized appearance is afterwards found. Such an adhesion explains very fully how the anterior or superficial portions only of the structures implicated are afterwards found to be deficient. Another result of cicatrization and contraction of the parts would necessarily be that diminution in the normal distance between the umbilical cicatrix and the genital organs, which we find in all these cases of extroversion of the bladder; giving to the epigastric and upper abdominal regions a disproportionately elongated appearance, and to the base of the penis and scrotum, and sometimes even to the anus, a more upward and forward position in relation to the neighbouring structures. All these peculiarities belong to the fœtus in the beginning of the second month of its development, at which time the author concludes that those pathological changes occur which lead to the arrest of development producing this peculiar deformity.

Efforts for the relief of this deplorable condition have been made by surgeons from time to time; and especially by Dieffenbach, Langenbeck, and Richard, but have not usually been followed by that degree of success which would encourage perseverance. In not a few instances the result of the operation has been fatal. In the course of the author's experience he has seen many attempts made, resulting generally in total failure of benefit, but none of them fatal to the patient. Flaps of integument were usually taken from the groins at the sides of the exposed bladder, and united by sutures in the median line, with the raw surfaces of the flaps placed upon the mucous membrane, with the hope that they would become united by their edges, and that the under raw surface would, in process of time, become converted into a sort of mucous membrane. In many cases the flaps sloughed wholly or in part, from causes which have seemed to the author to depend upon a want of sufficient foresight in so disposing the pedicle or root of the flap, that they should receive a supply of blood sufficient to maintain the adhesive processes necessary for their union, and to prevent their subsequent atrophy.

But, in most cases, a more immediate and powerful cause of failure was the great force with which the abdominal viscera were protruded, by the action of the respiratory muscles, into the yielding sac formed by the unsupported hinder wall of the open bladder. Under the straining of defæcation, coughing, and so forth, this hernia-like protrusion forced asunder the tender adhesions, even if these had already formed under the sutures, and destroyed all hope of success. This result has been often furthered by the want of sufficient boldness in the extent of the flaps, which were usually too scanty for the purpose.

In some cases the surgical attempts to relieve this deformity have been followed by death from peritonitis. This has been especially the case, apparently, after operations in which the flaps have been dissected too deeply from those parts of the abdomen where the parietes are thin—as in the structures just above the deformed bladder—so that

the peritoneum has become involved in the consequences of urinary irritation.

An ingenious operation, performed by M. Adolphe Richard, a colleague of M. Nélaton, ended fatally nine days after the operation from this cause. M. Richard's operation for *extroversion of the bladder* was done in October, 1853. It was founded upon one performed by M. Nélaton for a less degree of deformity, viz. simple *epispadias*, in the early part of 1852.

In M. Nélaton's cases, two in number, the bladder was entirely covered in by the normal abdominal coverings, and the ossa pubis were, probably, more closely connected together than in the cases of complete extroversion of the bladder. The urethra formed an open gutter upon the upper surface of the penis, with a small opening into the bladder close to its root. The operation consisted in turning down from the pubic region a long, narrow flap of integument, and placing it with its skin surface upon the urethral gutter, to the pared edges of which it was united by suture. From the upper part of the scrotum, close to the root of the penis, two flaps in one case, and a bridge of skin in the other, were raised, the latter including about one half the depth of the scrotum. Under this the penis was then passed, and the scrotal flaps, or the bridge of skin, were placed with the raw surface upon the reversed flap already fixed upon the urethra. In one of M. Nélaton's two cases this plan entirely succeeded, and in the other almost perfectly.

M. Richard's case, that of a man æt. 24, was one of a much more severe and complete character — viz. a fully-formed *extroversion* and *deficiency* of the bladder. Following the main features of Nélaton's operation, a large flap was taken from the umbilical region above the bladder, and turned down with its skin surface to the mucous membrane, so as entirely to cover it. Then from the front of the scrotum was dissected up a bridge of skin, which was passed over the penis and placed upon the umbilical flap; no side flaps were taken from the groin. ('Gazette Hebdomadaire,' p. 416, March 31st, 1854, and Nélaton's 'Pathologie Chirurgicale,' t. V., p. 469).

Professor Pancoast, of Philadelphia, is entitled to the

credit of applying the use of two reversed flaps, taken from the sides of the bladder at the groins, and turned with the skin surface towards the bladder. In his case, as reported in the 'North American Medico-Chirurgical Review' of July, 1859, (kindly forwarded by him to the author), which occurred in a male adult, and was operated on in the Jefferson Medical College in February, 1858, he succeeded in obtaining union between the edges of the flaps, and, after some trouble, cicatrization over their raw surfaces, which were left, uncovered by any other flap, to heal by granulation and subsequent cicatrization. By this means the suffering and annoyance resulting from the friction of the clothes, and the consequent continued inflammation and discharge, were removed. The hood or covering of the bladder thus obtained was so far effective, and at the same time cured an inguinal hernia which had coexisted; but still an opening remained above the penis which allowed of a free trickling of urine over the sides of the scrotum, and occasionally of a protrusion of the mucous membrane of the bladder.

In the appended cases operated on by the author, this result was obtained by proceedings differing from Pancoast's method, and in all but three (one of which was entirely unsuccessful) without any fistulous opening above the bladder being left. In all the cases in which the results were satisfactory up to this point, it was found, however, that as time went on, and the subsequent contraction of the cicatrices (all acting in the *upward* direction) progressed, this cause, combined with the hernia-like protrusion of the bladder through the arched opening above the penis, operated so as to increase this opening sufficiently to permit the lower portion of the bladder to be again subjected, in some measure, to external irritation, and so many of the good results became gradually diminished.

Dr. Daniel Ayres, of Brooklyn, New York, also operated successfully on a female, æt. 28, at the Long Island Hospital, November 1st, 1858, by taking a long flap from the upper and mesial part of the abdomen, reflecting it with the skin surface undermost, and connecting it to the raised

skin at the edges of the bladder by the interrupted suture.

Subsequently, on the 7th of December following, a second operation on the same principle was done to unite the anterior fourchette of the vagina; this also was successful. A urinary canal was formed and a prolapse of the uterus much relieved.

In both Dr. Ayres' operations, as explained in a pamphlet written by him, and dated 1859 (recently forwarded to the author by Dr. Raphael, of New York) the flap used was turned with its skin surface towards the exposed bladder, and the skin at the edges of the viscus was dissected up and brought together by sutures over the raw surface of the reflected flap.

In a letter lately received from Professor Pancoast the author is informed that the two last-mentioned cases are the only ones that he knows of which have been operated on in the United States of America.

Into this country Mr. Timothy Holmes, of St. George's Hospital, was the first to introduce the principle of reversed and superimposed flaps taken from the groin at the sides of the bladder, for the relief of this deformity.

On March 21st, 1863, he operated, at the Hospital for Sick Children, upon a boy, by a method which I have, in its chief features, followed in Cases 3 and 4 herein described. In Case 2 the same plan was supplemented by a reversed umbilical flap. Mr. Holmes's case was published in the 'Lancet' of June 27th, 1863, and also, with others, in his work 'On the Surgical Treatment of the Diseases of Children.' In his first case, which the author had the satisfaction of seeing a few months after the operation had been performed, the results were very good, the usual arched opening above the penis and a sinus at the umbilicus being the only openings into the bladder. The boy died some time afterwards from an affection of the brain totally unconnected with the operation; the parts were removed from the body, and are described in the 'Transactions of the Pathological Society,' vol. xv, p. 254. They are now to be seen in the

museum of the Hospital for Sick Children in Great Ormond Street.

It is a question that may fairly be raised here, what is the effect of the operation, in which the reversed flaps are employed, upon the growth of hair which takes place in the skin of this part at the period of puberty? Pancoast's theory was that the bulbs of the hairs became, in process of time, shed by the irritation and constant moisture of the urine. Such a result may doubtless occur by the process of "histological substitution" of the epidermis and its involutions by mucous epithelium, as we know that in other plastic operations and in the various prolapses of mucous structures these may be changed to skin. But in the only two adults on which the author has, up to the present time, operated, it has hitherto been necessary to pluck away the hairs from time to time as they grew and became incrusted with phosphatic deposit. In one of the cases the patient himself has always been able to do this, being endowed with much courage and intelligence, and having an earnest desire to free himself from the awkward annoyances of the deformity. In the other (the last case operated on) it has hitherto been necessary to accomplish this object by the hands of the surgeon. In both, however, the growth of the hair has evidently declined in vigour, and will, it is expected, ultimately cease altogether.

In the only case (the first of those hereinafter recorded) in which the author has been able actually to observe the condition of the deep surface of the flaps after the death of the patient (which occurred some months after the operation) a smooth, translucent, pseudo-mucous membrane seemed to have formed over the deep or formerly raw surface—the flaps in this case not having been reversed. In those in which the reversed flaps were used, the finger introduced into the bladder some months or a year after the operation felt a uniform, smooth, slippery membrane, giving exactly the feel of a mucous membrane.

By proper attention to cleanliness, and by the use of an injection of warm water slightly acidulated with acetic or

nitric acid, the accumulation of phosphates and mucus in the chinks and corners of the covered bladder can be entirely removed.

In all the successful cases the comfort and health of the patients have been greatly improved after the operation, so that it may be concluded that no bad results usually ensue from the covering in of the bladder, and no irritation of the ureters from the internal growth of hair or other accumulation.

At the very commencement of the author's operations on these cases he felt the importance of arranging the base of the groin flaps in such a manner that a free and uninterrupted flow of blood through them should immediately follow the operation, so that sloughing or shrinkage of the structures should be prevented.

He also endeavoured to counteract the upward contraction of the cicatrices after the operation by retaining intact the connection of the skin forming the root of the flap with that of the penis and scrotum, so as to ensure that the latter should be drawn up with the contracting parts, and thus prevent, as far as possible, the subsequent exposure of the lower part of the bladder produced by their separation. This disposition of the flaps left the external pudic, and often the superficial epigastric, vessels undivided in the root of the flap, whereby their vigour and activity of repair were preserved. In none of the following cases did sloughing of the groin flaps occur.

In other particulars, such as to obtain a completion of the circuit of adhesion around the upper part of the newly formed bladder, he has, in the last four cases, modified the plan of a reversed or inverted flap, taken from the umbilical region above the bladder, by covering its raw surface with two *lateral* or *groin* flaps, having their attached bases directed towards the scrotum. In some of the earlier cases the walls of the umbilical region were so thin, and the integuments so attenuated, that the attempt to turn down a flap of integument would have been attended with the risk of getting deep enough to expose or open the peritoneum. This circumstance, though not in itself considered by the author to be

such a serious matter as the older surgeons supposed, would, from the unchecked flow of urine over the parts after the operation, be apt to set up peritonitis in a subject whose weakness of conformation may be supposed to render him very liable to such a result, and especially if the urine found its way into the abdominal cavity. Such an occurrence it would be almost impossible to prevent after an accident of this kind, as the fatal results in M. Richard's and in other similar operations have indeed proved.

An attention to the details of the following cases will show that in these patients the difficulty of closing the umbilical opening which remained after the first operation was very great, and sometimes necessitated frequent attempts by secondary and minor operations, and that even after these complete success was not always obtained. The subsequent great contraction of the parts, however, very much aids the surgeon in closing up such fistulous openings, if sufficient time be allowed, and the sinus be not large enough nor direct enough to allow the mucous membrane to protrude through it. If it be so, then dilatation of the opening, instead of its contraction, is usually a rapid consequence.

In reviewing the cases it will be seen that, upon the whole, in those adapted for the practice, a greater speed and certainty of success can be obtained by this method of performing the first operation than by any other. There is greater probability of the whole of the bladder being covered in without sinuses by one operation.

In three of the cases, the smaller of the two *lateral* flaps was used as the reversed one, while a still smaller inverted flap was also turned down from above the bladder. The larger groin flap was superimposed upon the two.

In all these a sinus was left at the upper part, which was closed with difficulty, and proved that the umbilical flap, to be effective, must be large enough to afford an extensive surface of adhesion.

At the same time the umbilical flap must not be too large, or the lower part of it will slough from the feebleness of the circulation in it, and from the pressure to which it must neces-

sarily be subjected by the superposition and union of the groin flaps. The vertical depth of the flap should usually be rather larger than that of the exposed bladder itself.

But after the bladder has been by any of these methods completely covered in, leaving the usual arched opening above the penis, what is the condition of the patient after the contraction of this extensive cicatrix? In all the author's cases he has found that, under the combined influence of the contraction and the dilating protrusion of the bladder, the interval of separation between the bladder coverings and the penis has got gradually larger, until at length protrusion of the mucous membrane again occurred to some extent. It was also found that the exposure to friction of the tender upper mucous surface of the penis caused superficial, but very painful, excoriations of the glans and urethra; and that it was difficult, if not impossible, to fix a portable urinal around the penis without including the scrotum and a great part of the covered bladder.

The constant and painful excoriations produced on the scrotum by the trickling of the urine caused so much distress, in one of the cases operated on successfully as to the bladder covering, that, at the patient's earnest wish, the author proceeded to make an attempt to form a preputial covering for the glans penis, and so to surround the base of the organ as to accomplish a sort of substitute for the urethra, upon and around which an urinal could be fastened, or an elastic india-rubber band be placed.

At the time of the performance of his operations the author had not become acquainted with those of MM. Nélaton and Richard, of which a short notice has been given in the earlier part of this paper. On referring to the works from which that notice has been abstracted, he finds that in the principle of the bridge-like scrotal flap, and likewise in that of the umbilical reversed flap, as applied to exstrophy of the bladder, he himself, as well as the other operators above mentioned, has been forestalled by these surgeons; the method was, however, in M. Richard's hands, an entire failure. The want of success, and the fatal result, in M.

Richard's case was owing to his having attempted too much by one operation. A division of the operation into two stages—the first to effect the closure of the upper part of the bladder, and the second to shut in the lower part and to form a prepuce and complete the urethra—together with a little more delicacy in the dissection of the umbilical flap, would have had a better result. In none of the author's cases has there been the slightest approach to peritonitis, which the autopsy showed to have been the cause of death in M. Richard's case. He has, up to the present time, operated in this manner upon three patients (viz. Nos. 6, 7, and 8 of the reported cases), all of whom have been entirely free from dangerous symptoms, and have succeeded in accomplishing the objects for which they were intended.

The operation to form a preputial covering, as performed by the author, consists in raising the whole front of the scrotum, together with the skin covering the lower side of the penis—going deep enough to include the muscular layer of the *dartos scroti*—so that these tissues form a sort of bridge of skin connected with the groin on both sides. This is then lifted over the penis (which the great extensibility of the parts permits easily to be done), and placed upon a bed, or raw surface, prepared for its lodgment by turning down a collar or flap from the arched border of the bladder-covering above, and from the sides of the urethra and penis below, as far forward as the glans.

A continuous thin wire suture holds the deeper or reversed flaps together, and a single line of interrupted sutures connects the transplanted scrotal structures to the border of the bladder-covering. The gap in the scrotal wall is afterwards easily closed in over the testicles by reason of the great extensibility of the hinder part of the bag, which is left intact; the margins of the wound being brought together vertically by thickish wire sutures that will not easily cut out.

The success of this proceeding at both the first and second trials, and the very beneficial results which have ensued, by covering the penis and urethra, as well as the bladder, with

tissues which in a considerable degree fulfil the intention of the normal structures, can only be rightly appreciated by an actual inspection of the patient so treated. At a meeting of the Fellows of this Society during last session, the author brought for inspection the subject of the last case described in this paper. In this man the transplanted dartos encircles and embraces the newly formed urethra, so that when the finger is introduced into the bladder it is clasped and held with considerable force; and this in progress of time may help to retain the urine in the cavity of the bladder. An instrument can now be easily fixed around the urethra without including the scrotum, and the whole of the urine passes over the urethral channel as over the spout of a jug, with very slight trickling down the sides.

In the first stage of the plastic operations for the relief of these cases, viz. that of covering the bladder itself, the author's experience leads him to believe that the chief difficulty arises from the hernia-like protrusion of the hinder wall of the exposed bladder by the action of the abdominal muscles upon the contained viscera. In the second stage, viz. that of forming the new prepuce and completing the urethra, the chief difficulty arises from the occurrence of erections in the imperfect penis, caused perhaps by the irritation of the sutures; these displace the united parts, or rupture the newly formed adhesions, before they have acquired sufficient tenacity to resist tension. He has found continued *cold applications*, such as irrigation, or ice bags, to be the most effective way of controlling the erections.

He places much reliance, in dealing with the former difficulty, upon the *position* of the patient after the operation, who should be placed in almost a sitting posture, with the knees drawn up, tied together, and placed over a high bolster. This relaxes the abdominal and pelvic muscles connected with Poupart's ligament, completely, and also allows the urine to drain off by gravitation from the raw and adhering surfaces.

CASE 1.—William E—, æt. 6½, living at Ware's Passage, St. Pancras, admitted into King's College Hospital, September 11th, 1863, for the relief of a congenital deformity of the bladder and penis—*ectopia vesicæ* and *epispadias*. He has had, since his birth (which occurred at full time), pretty good health, but has always suffered from pain and irritation of the exposed mucous membrane after walking or playing about. Has never had anything done for the malformation. The hinder wall of the bladder projects much beyond the abdominal surface, and is red, inflamed, and much excoriated from the friction of his clothing. The penis is short, but its glans is of the natural size. The papillary orifices of the ureters can be seen at the lower part of the exposed bladder when the penis is a little depressed. A fully formed testicle is felt on each side in the groin or upper part of the scrotum. He has never worn an instrument for catching the urine.

On the 17th of October, under chloroform, the patient was operated on by Mr. Wood in the following way:

A triangular flap of skin, with its base downwards, was dissected up on each side of the exposed bladder, leaving the flap attached by its base to the skin of the groin at Poupart's ligament. The apex of each flap met the other at the median line above the exposed bladder, in such a manner that the raw surfaces exposed by lifting them were continuous at that point. The inner edges of the flaps were made close up to the bladder, and were brought together in the median line, and united by interrupted wire sutures. The penis was then fastened down to the scrotum by a silver wire suture passed through the frenum, to allow a free escape of the urine. The angles of the groin and umbilical incisions were then united by wire sutures. The patient was placed in bed with the shoulders raised into almost a sitting posture, to relax the superficial abdominal structures and so relieve the strain upon the sutures, and prevent the urine from flowing over the raw surfaces. During the first week after the operation the upper part of the flaps became united, but the lower three fourths had separated under the strain of the protruding bladder. A considerable portion of the incisions

in each groin had become joined together by adhesion. The rest of the wounds in the groin were filled with granulations, which, by the middle of November, had become cicatrized over. The child remained in good health throughout.

On the 21st of November a second operation was performed under chloroform, for the purpose of uniting the flaps along their edges close down to the penis. The edges of the flaps were first pared off in a bevilled way, so that one should somewhat overlap the other. To relieve the tension a transverse incision about one inch and a half in length was made along the base of each flap on a level with the penis, so as to permit them to be united in the middle line by four quilled wire sutures, the lowest being placed close down to the penis. A piece of oiled gutta-percha tissue was then placed behind the flaps, in the cavity of the bladder, and turned over below so as to prevent the urine from getting easily between the edges of the suture. The surface was well dusted with oxide of zinc, so as to form a crust over the wound, with the same object. A curved tube of metal, like the end of a catheter, was lastly placed in the bladder over the penis to carry off the urine when it accumulated in the lower part of the bladder. Strapping was placed across the lower part of the abdomen, so as to draw the integuments of the flanks towards the median line. The result of this operation was union of the middle of the lateral flaps in the median line for the space of about two inches, leaving an aperture above and below, from the failure of the uppermost and lowest sutures in procuring adhesion. The patient still continuing in good health, he was on December 5th again operated on for the closure of the upper opening. An oblong flap, sufficiently large to cover the upper opening, was dissected from the skin of the abdomen, above the bladder, and a little to the left of the median line. This site was chosen (a little to one side) on account of the great thinness of the abdominal tissues immediately above the bladder at the site of the umbilicus. The base of the flap was dissected down close to the aperture, and it was then turned down so as to present its skin surface to the cavity of the bladder.

The edges of the opening were then pared freely, and brought together over the inverted flap, and secured to it and to each other by harelip pins. The result of this operation was a complete closure of the upper opening into the bladder, and a most firm and satisfactory covering for the upper three fourths of the exposed mucous membrane.

The lower opening at the penis still remained larger than was desirable, and, as the boy assumed the erect posture and moved about, the mucous membrane of the bladder was seen to protrude and force open the aperture in the manner of a hernia. It was, therefore, determined to perform another operation at the lower part upon the same principle as that which had proved so successful above.

On the 17th January, 1864, accordingly, the patient being under chloroform, a square flap was raised from the front of the scrotum, the base of which was turned upwards towards the bladder, and included in its width the under surface of the skin at the root of the penis. This was reflected upwards on the left side of the penis, with its skin surface turned towards the bladder. A smaller flap was also turned up on the right side to cover the right lower corner left uncovered by the root of the penis.

The edges of the first formed lateral flaps, which still remained ununited for about an inch and a half above the penis, were then freely pared, and bevilled off, and made raw underneath. These were then brought over the reflected scrotal flaps, and united by harelip pins in the median line.

The last operation resulted in complete union of the flaps, leaving a small aperture above the root of the penis, through which the urine escaped with freedom. The last pin was removed on the 28th of January, and in a few days afterwards all the sores were entirely healed. He remained in the hospital for a month while an urinal apparatus was being fitted, and also in order to be watched as to the permanence and efficacy of the novel condition of the bladder. Unfortunately during that time some bad cases of erysipelas

occurred in the ward, and in the next bed to the patient a woman died of that disease. On the 23rd of February he began to show symptoms of swelling on one side of the nose, originating, apparently, in a small impetiginous sore which had formed in the left nostril. He refused food, and was sick several times. His pulse rose, and he was feverish and restless. For the next four days he got worse daily, the vomiting continued, the swelling of the face increased, and assumed a dusky, reddish-blue appearance. He was not, however, delirious; dosed at nights, and complained of no pain, except in his side occasionally; this was relieved by fomentations. Quinine, brandy, and beef-tea were administered by the rectum, as the constant vomiting precluded any attempt at support by the mouth. His pulse gradually got quicker and feebler, his tongue dry and brown, and his breathing hurried and short, and on the 27th of February he sank and died. The parts operated upon remained quite healed and unchanged during his illness, and he passed urine nearly up to the time of his death. In the post-mortem examination no appearances were found which could account for death. The kidneys were healthy; a small quantity of thick urine, opaque in appearance, was observed in one of them. The ureters were enlarged and hypertrophied, as is usually the case. No purulent deposits were, however, found in any part of the body.

The pelvis and its contents, and the lower part of the belly were kept as a preparation, which is now in the museum of King's College, London. It was exhibited at the meeting of the Pathological Society, May 17th, 1864, and is recorded in their 'Transactions,' vol. xv, p. 150.

In this case, which was operated on at first, in the way in which these cases had usually been done in this country, the union of the lateral flaps, which was at last effected in the median line, was obtained with much difficulty, and only completed after repeated operations. The author's attention had been thus early directed to the utilization of the front part of the scrotum in covering the lower part of the bladder; but it was done very partially, though, so far as it went,

successfully. The detached lateral flaps taken from this source were, in this instance, made the inverted flaps, and placed with the skin surface on to the bladder.

The ease with which the flaps were obtained, and the rapidity with which the wounds afterwards healed, notwithstanding the constant flow of urine over them, encouraged a subsequent trial of this source of supply which was more fully and successfully recurred to in Cases 7 and 8, hereafter described. The inverted umbilical flap was not employed, the tenuity of the parts at this point being sufficient to deter the author, at the outset of his experience in these cases, from using the knife here.

Case 2.—Joseph W—, æt. 12, No. 4, Grange Court, admitted December 28th, 1863, into No. 2 Ward, under Mr. Wood, for operation for *ectopia* and *fissio vesicæ* with *epispadias*. A pale sickly looking boy, who had been for some time an inmate of the St. Giles' workhouse. The mucous membrane of the exposed bladder projected very much beyond the abdominal wall, forming, when he stood up, a red, loose, elevated tumour which was somewhat larger in lateral extent than the bladder usually is at his age; this was much excoriated, raw and bleeding, from friction against his clothes, and secreted a profuse muco-purulent discharge. The angles of the separated pubes seemed also to be farther apart than usual, and more projecting; and the abdominal walls were thin and weak just above the bladder. His gait was waddling and feeble, and altogether the case was one of an unpromising character. He had worn an instrument, but was obliged to give up its use on account of the heat, irritation, and discomfort which it occasioned. When he laid down the projecting tumour was more irregular in profile, and formed an elevation about an inch higher than the abdominal surface—about two inches in vertical by three and a half inches in transverse diameter. When he coughed the tumour was much increased in size. On pressure when the abdomen was relaxed, in the triangular space between the recti muscles just above the exposed bladder a solid thick cord could be felt running upwards, which was, probably, composed of the oblite-

rated hypogastric arteries and superior false ligament of the bladder. The scrotum was small and round, and both testicles were felt in their normal situation. He stated that he was under treatment and operated on at the Middlesex Hospital a year ago, but could not give any account of the nature of the operation.

January 17th, 1864.—To-day, with the aid of chloroform, Mr. Wood operated on the patient in the following manner:—

First, a leaf-shaped flap was dissected from the groin above Poupart's ligament on each side, the left flap having its base downwards towards the saphenous opening and the right one towards the bladder and penis. The left flap was made one third larger and longer than the right. A cold-water sponge having been applied to the raw surfaces to stop the bleeding, another thinner flap was then dissected very carefully from above the bladder, of a lunated shape, the width being that of the upper part of the bladder, and the depth about one inch in the central or widest part. This proceeding required extreme care and circumspection on account of the thinness of the abdominal parietes, and the separation could not be carried within half an inch of the upper margin of the exposed mucous membrane. The smaller, or right, lateral flap and the upper lunated one were then turned each with its skin surface towards the exposed mucous membrane, and fastened together by a continuous wire suture, the ends of which were left long at each side, so that it could be easily withdrawn when needed. The larger flap from the left groin was then placed upon the inverted raw surfaces of the other two, which it completely covered. The wounds left by the several flaps were then drawn together by harelip pins, the upper one in a transverse, and the lower or groin wounds in a vertical direction, so as to avoid any traction upon the flaps themselves. A curved urethral tube was then fastened over the penis, which latter was stitched down to the scrotum by a wire suture passed through the *frænum preputii*. Collodion was freely applied to the margins of the several sutures, the skin was freely anointed with oil, and broad straps of adhe-

sive plaster were carried across the belly from hip to hip to draw the cutaneous structures towards the median line. The boy was put to bed in a half-sitting posture with his knees tied together and supported on a pillow, and a sponge placed under the penis. Three or four days after the operation the edges of the flaps began to look very sloughy, and also those of the incisions. He looked much out of health and did not eat well. All dressings were removed and the parts smeared over with a mixture of olive oil and Peruvian balsam, and he took Liquor Cinchonæ, Ammonio-Citrate of iron, and small doses of Morphia.

On the 28th the sloughing had entirely ceased and the wounds were filling with healthy red granulations. The upper or umbilical flap had almost entirely disappeared by sloughing and shrinking, leaving an opening at the upper part of the right side, through which a small portion of the mucous membrane of the bladder appeared. A small bed-sore had made its appearance on the sacrum; this was frequently and copiously anointed with the balsam oil.

On February 22nd all the sores looked healthy. Those in the groin had much contracted, and at their centres were filled with red granulations. The umbilical sore was almost healed, and the bed-sore entirely so. The condition of the patient at this time showed an opening above the united groin flaps of about three inches wide, revealing the vesical mucous membrane, and produced by the sloughing of the upper or umbilical flap. Just above the penis was an arched opening through which, by depressing the penis, the orifices of the ureters could be seen.

Second operation.—On the 12th of March, under chloroform, two additional lancet-shaped flaps were dissected from the abdominal integument, just above the old groin cicatrices. The left of these had its base turned towards the exposed mucous membrane at the upper opening; and the right one had its base directed towards the groin. The left one was then reflected with its skin surface turned over upon the mucous membrane; and the right one was turned with its raw surface upon that of the other. The upper edges of the united pri-

mary flaps were made raw, and united to the new ones by interrupted wire sutures. The new flaps were similarly connected to the margins of the wound whence they had been taken, which was continuous across the median line.

After this operation also the edges of the wound became sloughy, and did not do well. He was moreover attacked by severe bronchitis with free expectoration of muco-purulent matter, which did not, however, become rusty coloured. His pulse was quick and feeble, and his tongue covered with a white film. After a course of treatment consisting of Ammonia, Chloroform, and Liquor Cinchonæ, with brandy, strong beef-tea, &c., administered internally, and the balsamic oil and Lotio Plumbi applied externally, the cough improved and the wound became cleaner, and on the 2nd of April the flaps had adhered, and the parts of the wound which remained open were filled with healthy granulations. From this time his health steadily improved, his appetite became better, and his cough less, and finally the latter quite disappeared. The wounds ultimately closed in, with the exception of a small fistulous opening on the right side of the median line at the upper part, and another at the lower border of the flaps last transplanted. These gradually contracted, and when he left the hospital were much diminished in size, and transmitted no urine except when he lay down flat.

Third operation.—On May 21st, the boy having wonderfully improved in health and looks since the last operation, an attempt was made to diminish the size of the lower opening at the root of the penis, by paring the opposed edges and uniting them by wire sutures. This only succeeded to a limited extent, diminishing the aperture on each side about half an inch only, leaving still an interval over the penis in the median line of more than an inch wide. In this condition the boy was discharged, the repeated operations showing a want of power of adhesive union in his tissues, and his delicate health not encouraging any further proceeding. His condition, however, was vastly improved from that which he presented when admitted into the hospital. The tenderness

of the parts was almost abolished, there was less mucus and no bloody discharge, an apparatus could be worn with comfort and had the effect of keeping his belly, groins, perinæum and legs quite dry.

In this case the author first employed the reversed flaps, with another superimposed for the primary operation, but the umbilical flap was much too small, and the state of the boy's health hardly made his a fair case.

Case 3.—Frank C—, æt. 13, admitted into King's College Hospital October 10th, 1864, with *fissio vesicæ* and *epispadias*, presenting all the usual characters. Was the eldest of seven children, of whom five others were living and healthy. In the right groin he had also a congenital scrotal rupture of considerable size. The case was one favorable for operation, as the exposed mucous membrane, when the patient was at rest and recumbent, was not larger than two and a half inches in the transverse by one and a half in the vertical diameter, with abundant and loose skin in the groins and scrotum.

On the 15th October, 1864, under chloroform, the following operation was performed by Mr. Wood. On the right side a square flap, with the angles rounded off and its attached border turned towards the bladder, extending the whole width of the exposed mucous membrane and reaching along the posterior third of the penis also, was raised carefully from the integuments covering the hernia, and turned over with its skin surface towards the bladder, as in the operations performed by Pancoast and Holmes. On the left side a lancet-shaped flap, with its attached base downwards towards the scrotum and groin, and its apex curving towards the median line above the bladder, was taken from the integuments close to the left edge of the vesical mucous membrane and root of the penis, and turned with its raw surface towards that of its fellow from the right side, so as completely to overlap and cover it. At the upper part of the circumference of the bladder the two wounds were separated by an interval of about an inch, in which the skin was left intact. The flaps were united above and below by wire sutures, one or two of which were also

placed between them and the sides of the penis at its base.

October 21st.—The surfaces of the flaps had become completely adherent to each other, and the edges of the right side had also united. The sutures uniting the edges on the left side had ulcerated through without adhesion. The wounds in the groins had become partially adherent. The urine passed freely by the opening at the penis, and a little also flowed through the upper aperture at the umbilicus.

27th.—The wounds were now filled with florid granulations, and all looked healthy. November 3rd.—The wounds were rapidly cicatrizing and contracting.

On the 19th November, the wounds in the groins having become quite healed, an attempt was made to close the umbilical fistula. The upper border of the united flaps, forming a bridge-like covering to the bladder, was first pared at the lower edge of the umbilical aperture. Then the edge was split up by an incision about half an inch deep. Next a small lunated flap of skin was carefully raised from the median line above the bladder, about an inch and a half wide, with its attached border directed upwards. The edge of the flap was carefully bevilled off and fitted into the chink made between the two layers of the bladder-covering, and held there by a continuous wire suture.

This operation only partly succeeded. At one side the wire ulcerated through before the edges had become adherent, and the urine continued to flow through the diminished, but not closed, umbilical fistula. The operation was repeated on the 10th December with a quilled wire suture, and resulted in closing the umbilical aperture, with the exception of a small fistula which gradually contracted as the sore cicatrized, and at length entirely closed up. Towards the end of December he was discharged from the hospital with a vessel fitted to the penis and bladder, which kept him quite dry and comfortable.

In this case the reversed lateral flap was chosen for the side on which the hernia existed, with the object of preventing

more effectively the escape of urine on that side, and the chance of its getting into the coverings of the hernial sac, and so to the peritoneum. The lateral flaps proved insufficient to close up the bladder entirely, and another operation was required for the formation of an umbilical flap. The urethral tube after the operation was dispensed with as in former cases; it soon became clogged up, and the major part of the urine from the first passed by its side.

Case 4.—William F—, æt. 7, admitted into King's College Hospital for operation for the relief of congenital *fissio vesicæ* and *epispadias*, November 2nd, 1864. When admitted a red eruption was present on his belly and legs, which had lasted for some months. For this he was treated with tonics and alteratives till November 19th, when, the eruption having entirely disappeared, he was operated on in exactly the same manner as in the case last recorded. The lateral flaps adhered by the first intention over the whole extent, and the wounds in the groin and sides having also filled up and cicatrized over, on the 13th of December a second operation was performed for the purpose of closing the umbilical aperture which had been left by the first, and through which the urine had continued to flow whenever he lay down. On this occasion the base of the umbilical flap was left attached at the lower side close to the edge of the exposed mucous membrane, and the flap was reversed or turned with its skin surface towards the aperture. Another flap to correspond was then raised from the upper ununited edge of the bladder-covering, with its free border upwards, and laid with its raw surface upon that of the inverted flap. The two were then connected by a quilled wire suture, the wire being passed through and through the opposed flaps, and the ends fastened so that it could be released entire.

This operation succeeded in entirely closing the umbilical opening, and the boy was discharged, after two operations, in a vastly improved condition, both locally and generally. The removal of the continued irritation, soreness, and discharge, induced by the friction of his clothes, and the comfort of an

apparatus which kept him quite dry, reacted very beneficially upon his general health.

The ultimate success of the cases in which the lateral flaps were employed—one reversed, and the other superimposed—encouraged a repetition of the same proceeding. The delay caused, however, by the second operation upon the umbilical fistulous opening; and the liability of a repetition becoming necessary, from the difficulty of inducing the adhesive process in the attenuated, but dense and fibrous, cicatricial tissues which close in the abdomen in this situation, led the author in the next case to attempt a reversed umbilical flap at the first operation. The plan followed was—to form in one single operation two reversed flaps, one from the groin and another from the umbilical cicatrix, with a larger lateral flap superimposed upon and covering them both.

The next case was the first in which the author had operated upon a female child for this deformity; and, partly because of the comparative deficiency of the tegumentary structure, and partly because of the violent crying and struggles of the little patient, both owing to her extreme youth, it resulted in a complete failure.

Case 5.—The child was a female, æt. 1½, of sickly appearance and cross temper. She was admitted into King's College Hospital in the beginning of March, 1865, where she was kept for a month and well fed, to increase the substance of the tegumentary adipose structures, and to allay, if possible, the irritability of her disposition.

The parts presented, in the main, the characters of this deformity in the male, with the addition of a wide separation of the halves of the clitoris, which had failed to unite in the median line. In this respect it constitutes, in all the female children presenting this deformity which the author has examined, a marked difference from the corresponding parts in the male. The effect was to open up in front the entire wall of the vagina or urogenital sinus, and to expose the os and cervix uteri (which were otherwise normally formed) to

the flow of urine. The exposed mucous membrane of the bladder was thus entirely unsupported below, and projected after the operation downwards into the vaginal sinus, and so under the united flaps; thus bringing a powerful dilating force upon their slender adhesions, and causing ultimately their entire separation.

The operation was performed on the 8th of April, 1865. The right lateral flap was of a truncated lancet shape, with its base directed towards the side of the bladder. It was reversed, with its skin surface towards the exposed mucous membrane. The umbilical flap was next shaped out with a somewhat pyramidal form, having its base downwards towards the upper border of the bladder, and meeting the incisions of both the lateral flaps; this was also reversed on to the bladder. The left lateral flap was made large enough to cover both the others. Its base was directed downwards to the left labium and groin; its inner border closely skirted the left side of the exposed bladder; and its apex coincided with the angle of skin which bordered on the umbilical wound. The two reversed flaps were first connected by their opposed and conterminous edges by a continuous wire suture, and then the left, or larger, flap was laid over them, and secured by interrupted wire sutures. Flat pads of lint were placed over the whole, and secured by broad straps of adhesive plaster passing well round the hips; these supported the parts so firmly that no other bandage was needed. Adhesion had fairly become established, and the wires were removed only after they had ulcerated through on one side, but the poor child was very fretful, and cried and struggled violently until exhausted almost every day, in spite of all precautions and soothings. The bladder was found during these efforts to protrude downwards under the flaps very forcibly, and to stretch and separate the newly formed adhesions gradually; until at length the two lateral flaps separated, and with them the umbilical flap became also dislodged, so that the exposed viscus protruded, as before, to its full extent. The wounds, however, healed very quickly, and the flaps became united to their original seats, leaving a thick raised rim or margin all round the top and sides of the

exposed bladder, which had, when all were healed, the good effect of protecting it considerably against the friction of the clothes, and so the child was, after all, somewhat improved by the proceeding. The mother promised to apply again, if the child lived, when she became older and more amenable and tractable.

Case 6.—Alexander Wm. M—, æt. 14, of Ilford, admitted into King's College Hospital, September 14th, 1866, for relief of *ectopia* and *fissio vesicæ* with *epispadias*. A pale-looking lad, standing imperfectly upright, with the lower part of the abdomen drawn backwards, and the head bent forwards like an old man. This attitude is caused partly by the alteration, or shifting backwards, of the line of gravity passing through the imperfect pelvic girdle, and partly by the attempt to avoid the friction of his clothes upon the exposed bladder and the neighbouring skin, which are excoriated and inflamed, the former discharging pus constantly and sometimes blood. In consequence of his weak state of health he was kept for a while upon good diet, and ordered Tincturæ Ferri Muriatis ηxv, three times daily.

October 6th.—To-day Mr. Wood performed a plastic operation for the relief of the patient. The skin and fibrous tissues which closed in the abdomen above the bladder being in this case tolerably thick, firm, and resisting, a voluminous umbilical flap was first formed in the median line, extending across the whole width of the bladder, and dissected from the deeper parts close down to the edge of the cicatrix. The size of the flap was three and a half inches in the lateral and three in the vertical dimension, and was conterminous with the greatest width of the exposed mucous membrane. Its base was left attached about half an inch from the edge of the vesical mucous membrane, and it was turned down with its skin surface towards the bladder. Next a pyriform flap, about three inches wide, with its base directed downwards towards the scrotum and thigh, was dissected from each groin, and these were turned inwards and placed close to each other in the median line, each with its raw surface laid upon that

of the reversed umbilical flap. Three harelip pins were then passed across the median line from one of the superficial flaps to the other, each being made to transfix also the deep or reversed, flap, and so to hold the three firmly together. No other sutures were put into the flaps.

The wounds above the bladder and in the groins were drawn together by harelip pins and wire sutures in a vertical direction, so that no strain should be made upon the newly transferred tissues. Broad straps of adhesive plaster were then placed across to support the sutures, leaving, however, the flaps quite free from pressure. The patient was placed in bed in the sitting posture, with his knees drawn up.

11th.—Two of the pins were removed from the transplanted flaps, which had become very firmly united together in the median line, as well as to the angle of skin between the wounds on the left side.

On the 15th the whole of the pins and sutures were removed. The greater part of the wounds in the groin had become united by adhesion. The umbilical wound had also become partly united, and the rest filled with florid granulations.

On the 10th of November the parts had completely healed, with no fistulous opening whatever around the sides or at the upper circumference of the bladder. A chink on each side of the root of the penis (produced by the arched form of the urethral aperture) allowed the urine to trickle down the sides of the scrotum, before it rose high enough in the bladder to flow over the urethral groove. As this would form a considerable difficulty in fitting a portable apparatus to catch the urine, an attempt was made, by two small operations at different times, to close up these chinks, by paring the opposed edges and uniting them by harelip sutures. These were done on the 24th of November and the 15th of December respectively, with perfect success in closing up the lateral chinks of the urethral aperture, and reducing the size of the latter to that of the transverse diameter of the penis itself. Upon this an apparatus was fixed, and the patient left the hospital on the 4th of January very much relieved.

In the month of October, 1868, he was again brought for my inspection, and it was found that, by the contraction of the surrounding cicatrices in every direction, the urethral aperture had become considerably enlarged, so as to present an arch-shaped opening through which the mucous membrane of the bladder slightly projected, although not so far as to be exposed to friction from his clothes or from the instrument. The author having in the mean time been successful in forming a preputial covering for the penis, by the operation of transplanting the scrotum, it was proposed to the patient and his friends that he should be readmitted to undergo this further operation. An interview with the patient I—, Case 8, decided him to agree to the proposal.

The advantage resulting from the employment of a good-sized umbilical flap, as the reversed one in the first operation, for those cases in which the thickness of the abdominal parietes in that situation permitted of such a flap being dissected up, was very evident in the instance just recorded. It prevented from the first the formation of an umbilical fistulous aperture, which had been found so troublesome to close in former cases, necessitating secondary operations, and sometimes repetitions of such operations, which prolonged the treatment of the cases to an inordinate degree, and even, at last, did not always succeed in effecting a complete closure.

The employment of two large groin flaps to cover the umbilical flap on each side gave evidently an increased guarantee against the formation of fistulous openings at the sides. The inward traction at the roots of these lateral flaps also exercised a beneficial effect upon the urethral opening above the penis, by drawing the skin of the groin and scrotum towards the exposed urethra, and covering entirely the projecting orifices of the ureters.

August, 1869.—Since the above was written I have operated upon this patient by the second method followed in Cases 7 and 8, and he is now in the wards of King's College Hospital. The operation has perfectly succeeded in all its main objects. The penis is entirely covered by a very natural looking

prepuce of scrotal skin, and the artificial urethra closely contracts upon the introduced finger in a manner which leads to the hope that a partial power of retention will in course of time ensue.

The patient was unfortunately seized with a smart attack of broncho-pneumonia a few days after the operation, and the tension arising from constant cough, and the general debility and fever, produced a small slough at the upper border of the scrotal flap, which resulted in a small fistulous opening on the right side into the bladder. This has since been operated on by the method of transplantation of a flap of skin from the right side, placed upon the raw surface of small reversed collar-like flaps, dissected up from the margins of the opening. The parts united for the most part firmly by adhesion, and there is every probability at present of a complete closure and a perfect result.

Case 7.—W. P—, æt. 16, the son of a gentleman, a bright-looking intelligent youth, well grown and healthy, as far as the constant discharge and irritation resulting from *fissio vesicæ* and *epispadias* permitted him to be. The patient exhibited the usual stooping posture and waddling gait characteristic of the deformity. In spite of the utmost solicitude and efforts on the part of his parents to obtain for him, in London and Paris, an apparatus for catching the urine, keeping him dry, and warding off the friction of his clothes, he was, when first seen, in a deplorable condition of rawness, excoriation, and inflammation.

The condition of the parts differed somewhat from that usually found. The projecting part of the bladder upon which the right ureter opened was larger, more prominent, and more sensitive than the other; after much exertion it pained him severely, and often caused sleepless nights. At these times also an increased discharge of blood and matter occurred, especially from the right side; some of this could occasionally be seen to ooze from the ureter itself. On gently touching this part with the oiled finger, and its extreme tenderness required this to be done with great caution, a

certain amount of distension behind the projection led to the idea that the right ureter was more dilated than the opposite one. The area of the exposed mucous membrane was somewhat larger than in most cases, and there was extreme sensibility and tenderness.

On the 6th of June, 1866, the first operation was performed, in exactly the same way as that described in the last case, *i. e.* an umbilical flap of the entire width of the bladder was turned down from above and reversed, whilst two groin flaps with their bases towards the thigh and scrotum were placed upon it in the median line, and the three united by four harelip pins placed horizontally.

On the 11th the harelip pins were removed, and the lateral flaps were found to be adherent to each other as well as to the reversed flap.

On the 14th and 20th respectively the remaining sutures were removed. Up to this time the patient had done very well, his health and appetite had been good, and his excretions regular. A blush of erysipelatous inflammation then appeared in the right groin and extended a little way up the abdomen. It did not, however, reach the median flaps, which became daily more firmly united to each other.

In a few days the inflammatory blush disappeared, after a course of treatment of alteratives and tonics, and from that time the wounds gradually filled with granulations, cicatrized firmly, and finally healed without leaving any sinus, forming above the bladder a firm, shiny, triangular cicatrix.

On the 20th of July the patient was moving about with the parts entirely healed, after having been about five weeks in bed. There now remained an arched opening just above the pubis, through which, when he walked about or strained, a small protrusion of the mucous membrane occurred. On each side of this was a chink, extending downwards to the scrotum, the edges of which were in entire apposition when he lay down.

On the 29th of November the edges of the chink on the left side were pared and united together by three pins. This

resulted, after ten days in bed, in almost entire union of the chink.

On the 13th of December the chink on the right side was operated on in the same way. The greater protrusion of that portion of the base of the bladder upon which the right ureter opened (before alluded to) presented by its increased swelling and painfulness after the operation, an obstacle to a complete union of the chink on this side, and the result was a partial failure of union, which was established only in the outer or most dependent part. After twelve days in bed the parts had healed, and he got about very comfortably; he was kept dry by the use of an improved urinal which enclosed only the penis and scrotum. The constant dribbling of the urine over the scrotum, however, still constituted a source of pain and complaint, and both the patient and his friends were very desirous to have the penis entirely covered, so that an urinal could be fastened round the penis only. The author therefore proposed the plan for forming a complete preputial covering by transplantation of skin from the abundant scrotum, which was at once assented to.

Accordingly, on the 13th of May, 1867, the patient being in good health and spirits, and delighted with the anticipation of being made conformable to the fashion of other men, the author operated, under chloroform, in the following manner, assisted by Mr. Mason. First an incision was carried through half the thickness of the superficial flaps covering the bladder, about an inch distant from their arched lower margin, and extending along its whole length. A fold of skin was then turned down like a shirt collar, the dissection being carried nearly to the margin of the opening, leaving only sufficient base to carry on a vigorous circulation. Next, a similar fold of skin was dissected up from the sides of the penis and turned over close to the edge of the mucous membrane forming the gutter of the urethra. The upper fold and the lower were then approximated, so as to cover the opening entirely (except at the end of the urethra), with the skin surface directed to the mucous membrane. They were held in position by two continued wire sutures, which

were left with a long end protruding on each side, by which they could be withdrawn when no longer needed. Then an incision was carried across the penis behind the frænum, joining those first made on each side, and leaving only the frænum attached to the glans penis in front. Another and longer incision was next made along the lower border of the scrotum, from one side to the other, as deep as the "tunicæ vaginales," but not opening into them. The intervening bridge of skin of the penis and scrotum, including with it the *dartos scroti* and other subcutaneous structures, was then raised by free dissection from the front of the scrotum and lower surface of the penis, leaving the sides extensively attached to the skin covering the spermatic cords and groins. This was lifted up, and by a slight stretching motion, which its great elasticity permitted freely, was slipped over the penis, so that it could be laid with its raw surface upon those of the before-described folds, or collars, so turned over to meet each other as to form a bed of denuded surface to receive this bridge of skin. A line of interrupted and closely applied wire sutures sufficed to hold the upper margins of the bridge of skin to the cut edge of the skin constituting the covering of the bladder, forming a curved line of suture above the penis. The edges of the scrotal wound were then brought together vertically and united by sutures almost close up to the root of the penis. The great elasticity of the scrotal structures enabled this to be done, and the testicles comfortably lodged, with the greatest ease, the hinder part of the scrotum being amply sufficient for the purpose. No tube was used to keep open the urethra, a sitting position of the patient in the bed being sufficient to cause the free escape of the urine by its own gravity.

The parts healed after this operation almost entirely by adhesion, leaving only a small sinus in the median line, between the transplanted scrotal tissues and the original flaps covering the bladder. In the course of time this sinus contracted so much that the occasional application of a pointed stick of nitrate of silver was the only treatment needed to accomplish its closure.

The patient was moving about on the 9th of June, and after some months had been allowed to elapse, to ensure the contraction of the cicatrices and the complete bracing up of the parts, an instrument for receiving the urine was fitted on to the completed penis, without including the scrotum; this served the purpose of keeping him quite dry, and allowed him to move about in society without offensive smell or unseemly appearance.

As the parts became braced up by the contraction of the cicatrices it was interesting to find that, at nights, so long as he lay on his back or only partly on his side, the contraction of the transplanted dartos around the penis was sufficient to prevent the urine flowing from the bladder, in which it accumulated to a considerable extent, as if held in a dish with a closely shut cover. By the help of a large sponge placed between his legs, and secured to the perinæum by straps round the hips, he can now pass the night without wetting his bed in the least. This, as he expresses himself, is not the least of the comforts which the operation has conferred upon him, as it gives him a welcome relief from the pressure of the urinal worn constantly during the day.

When the tissues become more solidly contracted I am not without hopes that an india-rubber ring, passed round the end of the penis and over the new-formed prepuce, will be sufficient to keep the urine in the bladder for a short time even without the urinal.

Case 8.—Matthew I—, æt. 35, of Plymouth, where he had been employed in a wood-yard until compelled by his sufferings to leave work, was admitted into King's College Hospital, April 1st, 1868, for relief of *ectopia* and *fissio vesicæ* with *epispadias*. In addition to the usual condition of the bladder and penis there were, in this case, two small protrusions of a hernial character, about the size of walnuts, at the upper margin of the exposed mucous membrane near the umbilical cicatrix. These were very evident when he coughed or made any muscular exertion, and possessed a distinct hernial impulse.

The success of the case last described had been so marked and complete that it was determined in the present instance to follow the general plan therein adopted, and to complete, if possible, in two operations, the results before obtained after many partial and progressive steps. This would have the advantage of shortening the period of treatment and lessening the sufferings of the patient.

Accordingly, on the 4th April, 1868, the first operation was performed in the same way as that described in the last patient, viz. a large flap of a subquadrate shape, embracing the whole width of the exposed bladder, was dissected from the central abdominal region above the umbilical cicatrix, and reversed upon the exposed bladder. The thickness of the flap included the whole of the superficial structures, leaving only a thin layer of fascia covering the tendinous aponeurosis to furnish granulations for filling up the wound. The base of the flap was dissected down as far as the protruding hernia, but no further, and was so arranged that it would press upon and protect this weaker part of the abdominal parietes, and cover nearly the whole of the mucous membrane as well. The lateral flaps were made large, with the bases turned towards the scrotum and thigh, their inner borders skirting closely the lateral edges of the exposed bladder. A considerable portion of the skin at the base of the penis was also raised with the base of the flaps, so as to allow them to meet more closely in the median line at the level of the urethra. The flaps were fixed by four harelip pins, which transfixed also the greater, but not the entire, thickness of the reversed flap. The superficial flaps were also connected by wire sutures with the angles of abdominal integument left between the wounds caused by the transplantation of the flaps. These latter were also united together by wire sutures and harelip pins, the upper or umbilical wound in a vertical, and the groin wounds in a horizontal, direction, so as to avoid traction upon the flaps themselves. The man was placed in bed in a sitting posture, with his knees drawn up and tied together, and broad straps of adhesive plaster were placed transversely and obliquely across the abdomen and groins, to draw

the integuments towards the median line and lessen the strain upon the sutures. No urethral tube was used, the water freely escaping from the supra-penal aperture into a large sponge placed against the perinæum. After the operation this case did remarkably well, in spite of the nervous and irritable disposition of the patient, who exhibited in the fullest degree that intolerance of suffering and hysterical excitability, which long subjection to pain, soreness, and discomfort, usually produces in these unfortunates. The parts united almost entirely by adhesion where the surfaces and edges were in apposition; and the open wounds rapidly filled with granulations and cicatrized firmly, leaving, however, a small sinus on each side, which remained up to the time of the second and final operation.

This was performed in the theatre of King's College Hospital on the 9th of May, 1868, without any preliminary paring or union of the opposed margins of the arched urethral opening. A fold or collar of skin, embracing half the entire thickness of the united flaps covering the bladder, and about an inch in depth, was turned down over the root of the penis. Joining these incisions on each side, and extending along the outer edges of the urethral groove as far as the glans penis, two other folds were raised from the sides of the penis itself, about three quarters of an inch deep. These were turned over with their skin surfaces towards the mucous membrane covering the urethral groove. The opposed margins of these reversed flaps or collars of skin were then connected together by a continuous wire suture, the ends of the wire being left long and protruding, so that it could readily be withdrawn when its utility had ceased. A bridge of skin, embracing the whole of the skin covering the lower surface of the penis, as well as that forming, with the dartos, the anterior half of the scrotum, was then marked out by two incisions; one connecting the wounds already made at the sides of the penis by an incision passing transversely behind the frænum, and the other skirting the lower border of the scrotum from one spermatic cord to the other. The bridge of skin and dartos was then raised from the testes and tunicæ vaginales, and

the penis drawn down and slipped under it, until it was placed upon the raw surfaces of the reversed flaps already covering the urethra. The transplanted scrotal tissues were held in their new position by points of interrupted wire suture pretty closely applied, and the sides of the scrotal wound were drawn together vertically by the same means. Abundant room was found for the testes in the remaining posterior half of the scrotum, and the parts came together with great ease. Union by adhesion followed the operation over the whole extent of the wounds, except a small sinus in the middle of the transverse suture, through which one of the deep wire sutures emerged. This has remained as a small fistulous opening, admitting little more than the point of a probe, up to the present time. Its sides are somewhat valvular, and it does not readily permit the urine to pass out unless the artificial bladder be distended much, while, on the other hand, it affords a convenient opening for the introduction of a syringe to wash out the bladder. The scrotal wound healed very quickly, notwithstanding that the urine flowed unrestrainedly from the artificial meatus over it. Since the operation care has been required to wash out the bladder frequently, and also to remove the phosphatic incrustations which are apt to form upon the hairs. Up to the present time these latter continue to grow upon the surface of the reversed flaps, but only near the root of the penis. The flaps of this situation were unavoidably taken from parts naturally covered with hair. In the first six of the cases recorded the patients were young and the hairs not fully developed, but in the present case the trouble from this cause has been somewhat more persistent. By the introduction of a finger into the artificial urethra, which can easily be done, a pair of dressing forceps can be guided to the parts from which the hairs spring, and no difficulty is experienced in plucking them up by the roots and carrying off the incrustations with them. The use of an injection of dilute nitric acid, in the proportion of two drachms to the half pint of water, has been found to aid in the cleansing. When the accumulation of hairs and incrustation became great on one

occasion, considerable irritation was set up in the bladder, and the sinuses which last healed showed a tendency to open up and to discharge matter which had previously been formed within, or beneath, them in consequence of the irritation. These, however, readily closed when a thorough cleansing of the interior of the bladder had been effected.

This patient, I—, was exhibited to the Fellows of the Society at one of the meetings of the last session. Since then he has been again admitted into the hospital with a view to close up the small sinus still remaining between the scrotal and the first-formed flaps. His long continuance in the hospital on the first occasion had somewhat deteriorated his general health, and rendered futile an attempt which was made to close the sinus by paring its edges and uniting them by a wire suture. The sinus was diminished, but not entirely closed, by this proceeding. It should be mentioned that the carbolic acid putty recommended by Professor Lister was employed over the strapping in both the operations upon this last case. It had the effect, imperfect as its application necessarily was from the nature of the case, of diminishing the amount of purulent discharge. Its use produced (although care was taken to prevent its absolute contact with the skin) a certain amount of the dusky red, inflammatory blush which I have noticed to follow its employment in many other cases of a different character. That which the author has considered to be a still more useful and less irritating method of accomplishing the same end, is by the use of pledgets of lint dipped in a solution of the *sulpho-carbolate of zinc*, in the proportion of from three to six grains to the ounce of water. This preparation the author has found to be a most valuable agent in expediting the cure of gonorrheal and other purulent discharges. It combines the detergent and astringent properties of the sulphate of zinc with the antiseptic and antipurulent effect of carbolic acid, and is much more readily and conveniently applied than the carbolic putty, at the same time that it does not lose the carbolic acid in-

gredient by volatilization, which soon ensues during the use of the carbolic oil, putty, or watery lotion.

Since the operation, in the last case, the contraction of the cicatrices around the root of the penis have produced a furrow, or groove, at the junction of the scrotal tissues with the upper parts of the bladder covering, and contracted the urethral aperture to a considerable extent, limiting it, in fact, to the width of the urethral groove of mucous membrane. The forefinger can be introduced with a little difficulty, and thus the interior of the bladder easily explored. The edge of the dartos can then be felt contracting strongly upon the finger like a sphincter, and one cannot but hope that this process may continue until, finally, a certain power of retaining the urine until voluntarily expelled by the contraction of the hinder part of the bladder, aided by the abdominal muscles, may be obtained in some degree. At the present time, even when the patient lies down, a considerable accumulation takes place in the bladder, sometimes to the extent of a couple of tablespoonsful, which lies in the dish-like curve of the hinder wall of the bladder, and is held by the transplanted tissues acting like a lid to the dish. On rising from the recumbent posture, coughing, or otherwise putting into action his abdominal muscles, the urine becomes expelled with a sort of gush. Some little inconvenience was at first experienced in both the last-described cases on the occasion of an erection occurring in the malformed penis, an event which does occur, with emission of semen; and there is reason to believe, in the last case, with the effect of coitus, the poor fellow being in a position of obligation in respect to marital duties. This inconvenience has, however, disappeared by the stretching of the parts, and he has expressed in a sort of confidence his opinion of much increased power of intromission on these occasions. The penis is now covered close up to, and sometimes over, the glans by a hood of skin, very contractile and accommodating, formed by the dartos and skin of the scrotum. Between the artificial prepuce or dorsum of the penis and the proper abdominal covering of the bladder is a deep groove or sulcus, into which the opening

of an urinal can easily be fitted and made to enclose the penis entirely round, and it is not beyond hope that an india-rubber ring can, after some time, be worn so as to close up the urethra until a fitting occasion arises for the evacuation of the bladder. Thus a great comfort, which none appreciate so much as those deprived of it, seems to be placed within the reach of this poor man.

EXPLANATION OF PLATES I AND II.

PLATE I.

FIGS. 1, 2, 3, and 4 refer to Case 4 (Wm. F—).

FIGS. 1 and 2 represent the flaps during, and immediately after, the first operation.

FIG. 3 represents the flaps during the subsequent operation.

FIG. 4 represents the flaps after the patient was discharged.

a. The lateral reversed groin flap.
b. The lateral superimposed groin flap.
c. The reversed umbilical flap.
d. The superimposed flap from the upper part of *b*, the superimposed groin flap.
P. Glans penis.

PLATE II.

FIGS. 1, 2, 3, and 4 refer to Case 8 (Matthew I—).

FIG. 1.—The parts *before* the *first* operation, with the groin (A B) and umbilical (C) flaps marked out by a black line.

FIG. 2.—The parts immediately *after* the *first* operation, with the pins and sutures *in situ*.

FIG. 3.—The parts after the first operation and before the final one, with the black lines showing the outline of the flaps for the latter (D, E, F, *f*, G, and H).

FIG. 4.—The flaps *in situ* immediately after the second or final operation, with the continued (*x*) and interrupted sutures.

A and B. The lateral superimposed groin flaps.
C. The reversed umbilical flap.
D and E. The collar-like flaps from the margin of the first-formed flaps (A and B).
G and H. The collar-like flaps from the sides of the penis (P).
F. The scrotal, bridge-like, superimposed flap.
p. The frænum preputii.

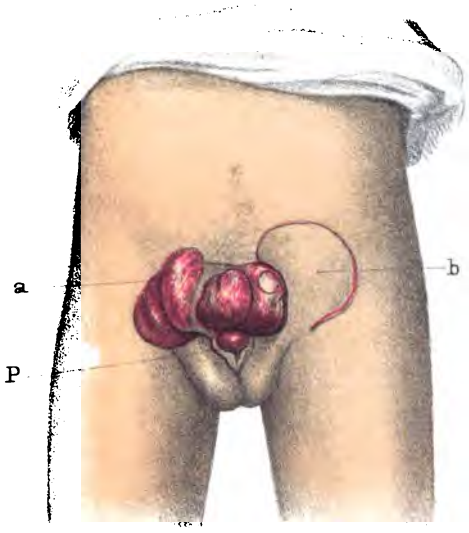

Fig. 1.

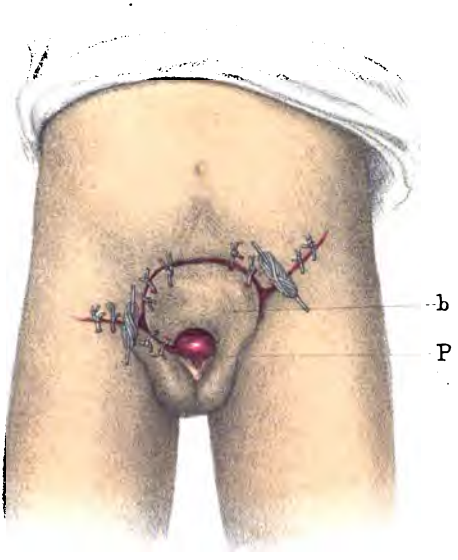

Fig. 2.

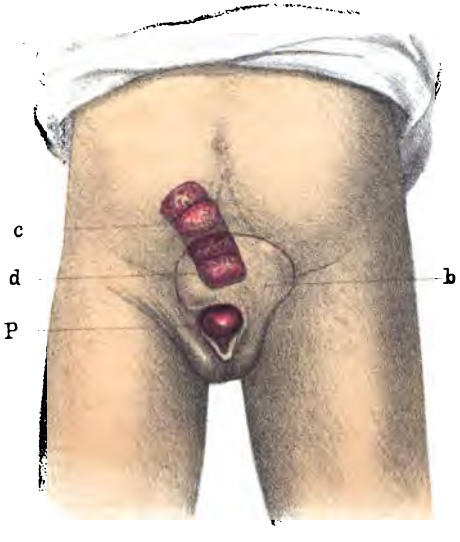

Fig. 3.

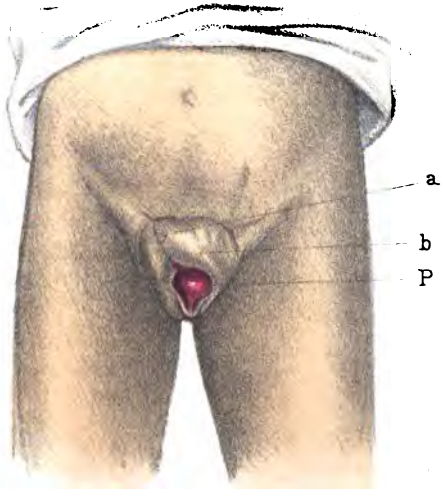

Fig. 4.

G.H.Ford chr. sc. W. West lith.

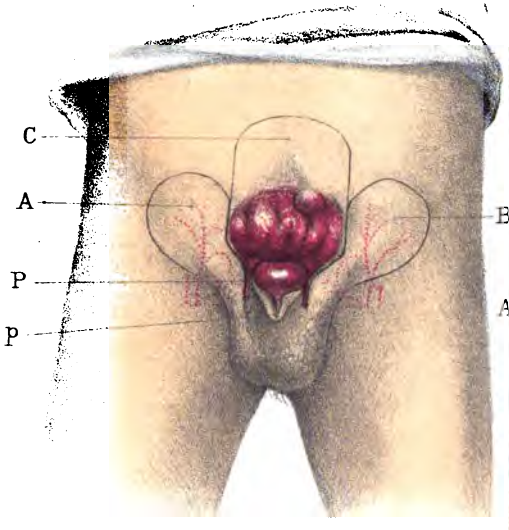

Fig. 1.

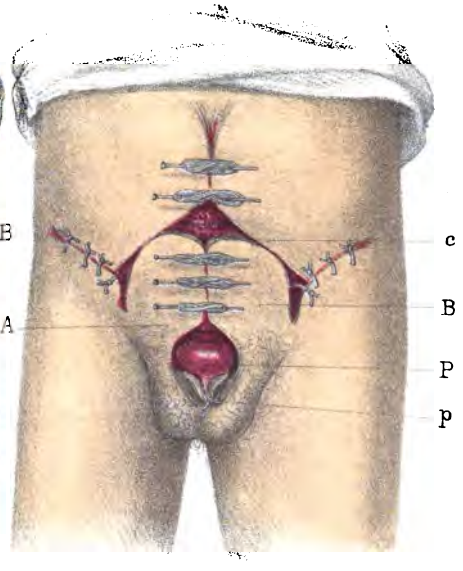

Fig. 2.

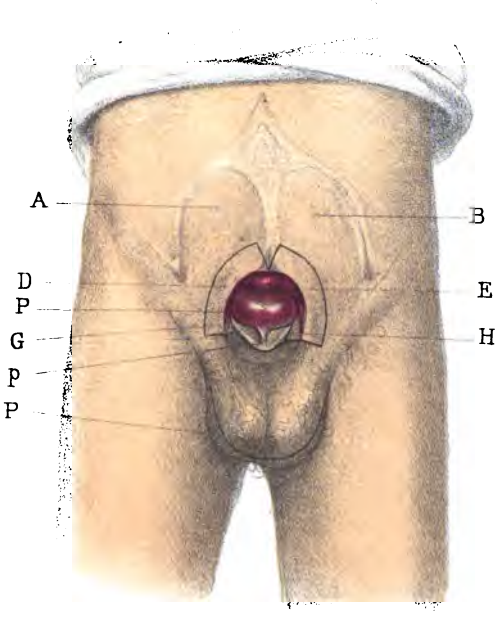

Fig. 3.

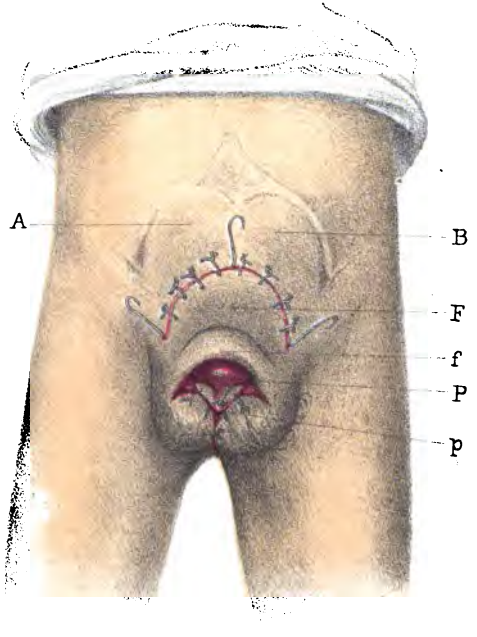

Fig. 4.

G.H.Ford chr. sc.

W. West. lithr

DESCRIPTION

OF A

DISLOCATION OF THE HEAD OF THE FEMUR,

COMPLICATED WITH ITS FRACTURE;

WITH REMARKS.

BY

JOHN BIRKETT, F.R.C.S.,

SURGEON TO GUY'S HOSPITAL.

Received Jan. 12th.—Read Feb. 23rd, 1869.

A WOMAN, æt. 35, of rather short stature, was brought into Guy's Hospital on account of the following injuries, the infliction of which she survived a few minutes only. The skull was broken, and the brain lacerated.

She had fallen from a second-floor window of a house on to the pavement, the height of which, from the ground, was from twenty to twenty-five feet.

After death it was observed that the left leg was slightly shorter than the right, and the whole limb inverted; the left great toe rested on the inside of the dorsum of the right foot, and there was considerable fulness in the left gluteal region. On rotation of the left leg slight crepitus could be felt in the region of the hip-joint.

When the gluteus maximus muscle was reflected the head of the bone was seen lying upon the posterior border of the

acetabulum, between it and the great sacro-sciatic notch, about one inch from the base of the spine of the ischium, above and anterior to it. At its upper border was the pyriformis muscle, at its lower the obturator internus, with the gemelli. There was the slightest laceration of the muscular fibres of the pyriformis. The cartilage-covered head of the femur was uncovered by its capsular ligament, a small piece of which lay torn upon it. At the edge of the fracture a few fibres of the ligamentum teres remained attached to the usual depression on its surface.

On further examination it was discovered that a portion

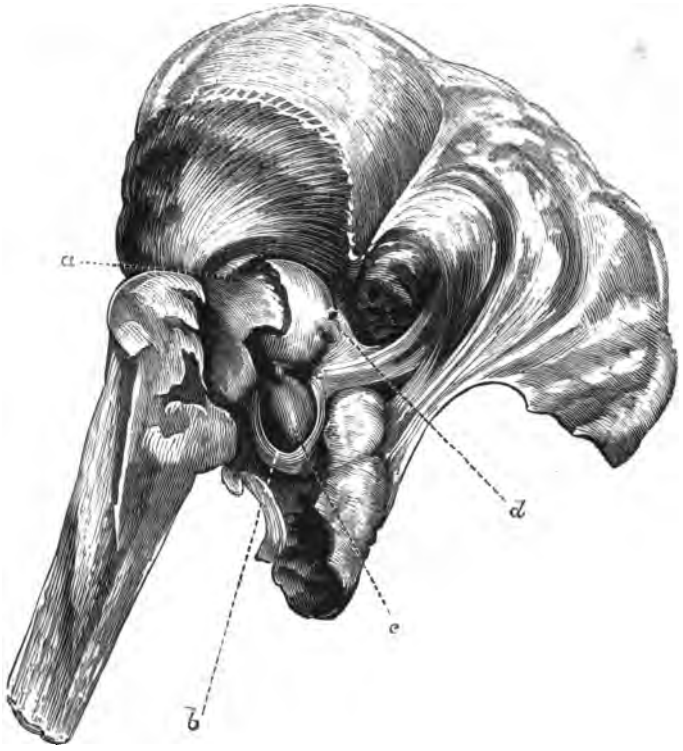

FIG. 1.—*a*. Part of capsular ligament. *b*. Cotyloid ligament. *c*. Fragment of head of femur in the acetabulum. *d*. A few fibres of the ligamentum teres.

of the head of the femur had been broken off. This fragment, to which the greater part of the ligamentum teres was still attached, remained in the acetabulum.

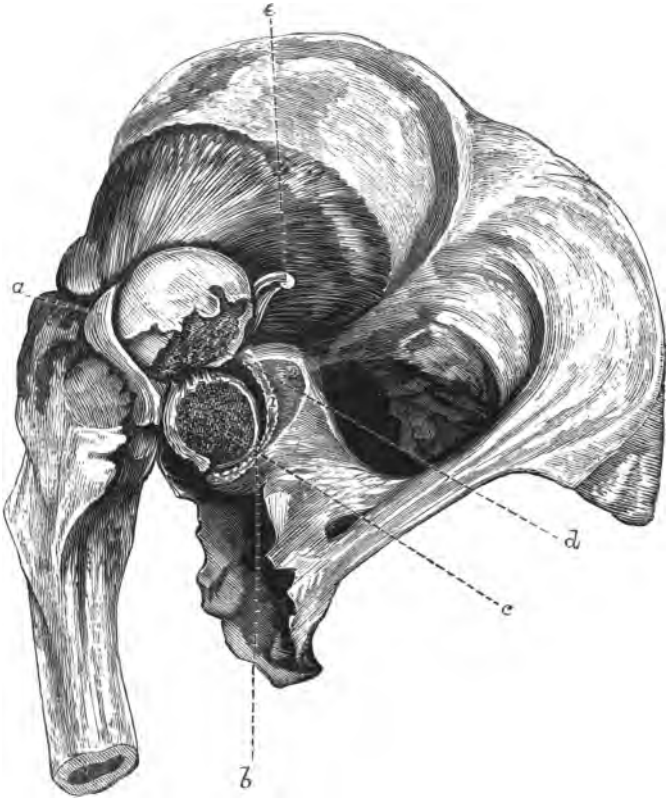

FIG. 2.—*a*. Capsular ligament. *b*. Acetabulum, its bare edge (1) exposed, and the bare surface (2) of os innominatum. *c*. Fragment of head of femur. *d*. Cancellous tissue of the head of the femur. *e*. Cotyloid ligament torn off from edge of acetabulum (1).

The fracture was remarkably even, and on a plane with the vertical axis of the shaft of the femur.

The flat face of the greater segment lay upon the posterior surface of the os innominatum, just above the posterior edge of the acetabulum, being prevented from ascending higher

by its attachment to the smaller segment, which was held in the cavity by the ligamentum teres. The cartilage forming a hinge between the segments was in contact with the posterior rim of the acetabulum.

The cotyloid ligament was detached from the posterior brim of the acetabulum. A portion of it, an inch long, hung from its superior border. The periosteum was stripped off the bone forming that portion of the outside of the acetabulum against which the broken surface of the head of the femur lay in close contact.

The rent in the capsular ligament was confined to its posterior surface. It was about two inches in length. The site of the rupture was at the iliac attachment for the upper part of the acetabulum and along its posterior edge; it then extended midway beneath the iliac and femoral attachments beneath the cervix, and ended at the lower part of the anterior surface. With this exception the anterior capsular ligament was unhurt.

The shape of the bone was normal and its tissue quite healthy.

After replacing the head of the femur in the acetabulum, the line of fracture could be made to correspond with the posterior edge of that cup, when the shaft was flexed upon the pelvis to a right angle and slightly adducted.

Remarks.—The dislocation of the head of the femur now described belonged to that class termed by surgeons backwards and upwards, or on to the dorsum ilii, although it was prevented ascending as high as usual on account of its peculiar feature. That feature, fracture of the head, the rarity of which will, I presume, be admitted, is the distinguishing characteristic of the injury. It is to record this fact that I have ventured to relate the case to the Society.

Authorities upon the subject of dislocations of the joints do not even allude to this complication.

M. Malgaigne states—"The luxations of the femur are but little complicated with fractures, either of the pelvic bones, the femur itself, or more distant bones."

("Les luxations du fémur ne sont guère compliquées que de fractures, soit des os du bassin, soit du fémur même, soit d'autres os plus éloignés."[1])

Having failed to find a parallel case in the book of Mr. Robert W. Smith, of Dublin, I wrote to that gentleman, who did me the favour to reply as follows:—"Although tolerably familiar with the literature of fractures and luxations, I am not aware of any similar injury having been placed on record as happening to the head of the femur."

We have then, probably, under observation an injury hitherto undescribed.

The mode in which the head of the femur was broken is worthy investigation. It may have happened in two ways. Either the head of the bone was split by being forcibly driven against the strong edge of the acetabulum; or the strength of the ligamentum teres and its attachment was sufficient to overpower the cohesion of the bony tissue, whilst the femur was violently driven upwards and backwards.

Perhaps both influences may have exerted combined action in the production of the injury.

As displayed in the woodcut, Fig. 1, the close adaptation of the broken surface of the head of the femur to the brim of the acetabulum, and the neat way in which the latter fits in between the fragments, would seem to favour the first explanation. On the other hand, as nearly the whole of the round ligament still keeps its hold upon the lesser fragment, it would appear that the bone tissue yielded to the traction exerted upon it, rather than the fibrous structures.

This view of the mechanism of the injury is taken by Mr. Smith. For with his letter to me he was so good as to send a drawing of an injury to the articular head of the tibia, of which he thus writes:—"I enclose a drawing of a lesion of the head of the tibia which I look upon as being quite analogous. They are both, in my opinion, examples of a class of injuries to which sufficient attention has not

1 'Traité des fractures et des luxations.' Paris, 1855, t. ii, p. 881.

hitherto been devoted; they are difficult of diagnosis and destructive in their results. I allude to the violent tearing off of portions of the articular surfaces of bones by the traction of powerful ligaments."

Lastly, the chief fact in this lesion may serve to explain some of the difficulties experienced in keeping the head of the femur in the acetabulum after its reduction. Most surgeons must have seen such cases, though fortunately they are rare. In them "crepitus" is usually an attendant circumstance, which is attributed to a fracture of the brim of the acetabulum, but the injury may have been of the kind above described.

To conclude, I have to thank Mr. Davies-Colley, the registrar at Guy's Hospital, for dissecting the preparation and describing it, as well as Mr. G. Turner, a student, for executing the sketches, of which the woodcuts are copies.

The preparation is in the museum at Guy's Hospital.

ON SOME

NEW DOUBLE SALTS OF CARBOLIC ACID,

PARTICULARLY CONSIDERED

AS AGENTS FOR THE TREATMENT OF DISEASE.

BY

ARTHUR ERNEST SANSOM, M.D., M.R.C.P.

COMMUNICATED BY

DR. BEALE, F.R.S.

Received Jan. 23rd.—Read March 9th, 1869.

1. The progress of scientific inquiry has tended greatly to establish the doctrine that many of the diseases which afflict the animal body are due to the influence of organized particles, and that these germs of disease transmitted "ab extrâ" to the living organism, grow and multiply, and by their growth and multiplication inaugurate the various phenomena of disease. That this morbid process bore a striking analogy with fermentation had long ago been taught. This analogy, however, is established with a much greater completeness now that Pasteur has demonstrated the true nature of fermentation, viz. that it depends upon the presence, development, and multiplication of specific organized bodies of extreme minuteness. The same kind of observations which

established this fact in regard to ordinary fermentation is now in course of application to the investigation of the changes in the body induced by communicable disease; and some of the conclusions which have been arrived at are deserving of rank amongst the best-established truths in biology. Thus, the researches of Beale and Chaveau have shown that the manifestations of the vaccine disease are due to the operation of minute organized particles which float in the fluid of the inoculable vaccine.

2. Concerning the physical qualities of these organized germs, it is known that, though they vary in size in the cases of different diseases, they are almost incalculably minute; in some instances they cannot be removed from the fluid in which they float by the most careful filtration; they, for the most part, manifest phenomena of active movement, which is sufficient to prove that, minute as they are, they are composed of segments of still more extreme minuteness; they have a long-persistent vitality, and can resist the influence of high temperatures, though a heat of 100° C. is usually sufficient to destroy them.

3. These germs are readily capable of destruction by certain influences. Some chemical agents kill them by effecting their decomposition; other agents render them inert by robbing them of their vital endowments. Before their nature was understood, processes of "disinfection" for the prevention of the communication of transmissible diseases were largely practised. It is now generally admitted that the efficacy of measures of "disinfection" is due to their influence in destroying the organized germs of disease. This destruction disinfecting agents can accomplish in three modes—*First*, by altering the chemical constitution of the organic matter composing the germs; they may, like chlorine or iodine, superinduce an oxidation of the organic bodies, or, like tannic acid, they may cause a deoxidation thereof, or, as in the case of some metalline salts, they may unite with them and form a definite chemical compound. *Secondly*, by destroying the life of the germs without inducing any manifest chemical change; it is by this mode that carbolic acid has

been shown to operate. Or, *thirdly*, by a combination of these two modes, as in the case of sulphurous acid and the sulphites, which, when they act chemically, act as deoxidizers.

4. Although chemical and other means had long been adopted to arrest the vitality of germs of disease external to the organisms of those subject to their influence, it was not until recently that any plan of treatment was adopted with the avowed object of destroying the germs when once they have entered the living body, and when they are, by their growth and multiplication within the organism, actually causing the manifestation of the phenomena of disease. In 1861 Professor Polli, of Milan, instituted a plan of treating zymotic diseases by the internal administration of the sulphites and hyposulphites of the alkalis and alkaline earths, and the plan, according to the testimony of a large number of observers, has borne fruit in a large amount of success. Professor Polli, however, did not claim for these agents that they actually destroyed the vitality of morbific germs within the body, but he considered that, diffusing throughout the constituent tissues of the body, they rendered the latter an unsuitable soil for the growth and propagation of the germs; the sulphites, he said, operated, not upon the fermenting agents, but upon the "fermentible stuff" of the economy. I have carefully traced the operation of the sulphites both experimentally and practically in the treatment of disease, and I am convinced that their action is upon the organized germs themselves.

5. It is found that *traces* of sulphurous acid are sufficient to prevent the fermentation of a large mass of saccharine material. I have myself found that five grains of sulphite of soda completely prevent the fermentation of fifty grains of cane sugar mixed with an equal bulk of yeast; while the presence of two and a half grains under similar conditions restrained fermentation in the proportion of 38 to 11. It is obvious, from the small amount of the agent required to produce the effect, that the result cannot be due to any chemical power of deoxidation that the sulphite possesses. Furthermore, if the sulphite of soda be administered to an

animal, in the tissues of the latter after death the salt is proved to exist as undecomposed sulphite; as sulphite, also, it for the most part appears in the urine. Although, however, it is thus shown that the salt exercises a very slightly appreciable chemical change upon the organism, it is ascertained that it almost totally prevents post-mortem decomposition. From a large series of observations it may be concluded that the sulphites arrest and prevent the development of organized germs, and there is great reason to infer that they do so by reason of no chemical influence, but by reason of a faculty which they possess of arresting the vitality of low organisms. The lesson taught by the results of the treatment instituted by Professor Polli appears to me to be that a soluble salt which has the action of a poison towards organized particles such as the germs of disease are believed to be can be administered, absorbed and retained within the animal body, without producing any deleterious effects; that it creates a manifest change upon the body, enabling it to resist the processes of ordinary putrefaction; and that in diseases which have been ascribed to the influence of morbific germs its administration has been of signal service.

6. There is another agent, however, which has been proved to manifest a similar and probably a higher power in extinguishing the life of low organisms; this agent is carbolic acid. For its introduction and for the investigation of its properties we are greatly indebted to Mr. Calvert in this country, and to M. Lemaire in France. It is known to have a powerful influence in killing fungi, microzoa, insects, and their ova—in fact, all the lowest forms of animal and vegetable life. It arrests fermentation and putrefaction, not by inducing any perceptible chemical change—for M. Lemaire and Mr. Crookes have separately proved that it neither interferes with any chemical change nor itself suffers any change —but simply by extinguishing the vitality of ferments. It is ascertained that a quantity of carbolic acid sufficient to destroy myriads of lowly endowed organisms may be administered to mammalia without inducing any deleterious effect upon the latter. But there are certain difficulties and incon-

veniencies in the administration. The following points are ascertained from observations upon the lower mammalia:—That if carbolic acid be administered pure or but slightly diluted, it acts as a violent irritant and caustic; that in doses somewhat feebler it causes agitation, convulsion, partial or complete loss of sensibility, narcotism; that it tends to induce congestion of the vessels of the brain, the stomach, the intestines, and the lungs. In small doses, however, it is absorbed into the system and finally exhaled by the lungs, producing only, occasionally, such symptoms of slight narcotism as are produced by alcohol, which in its chemical constitution it much resembles.

7. Carbolic acid has now been employed as an internal remedy in many cases of disease, especially those in which, as there are good grounds for believing, the system is embarrassed by the presence and multiplication of organized poisons. The records indicate that much success has attended its employment. In the treatment of cholera it was found to be valuable. In few diseases is the evidence of causation by organized germs greater than in cholera; no agent has been discovered more potent than carbolic acid to destroy the vitality of organized particles; if, therefore, it be possible to administer to the living body a sufficient quantity to prove fatal to the contained organisms, there are good grounds for expecting a successful treatment.

8. The difficulty, however, has been the administration of carbolic acid in sufficient quantities without the production of its irritant and caustic effects, and its absorption with due rapidity. It is at all times necessary to dilute it with a large quantity of water, and in this way it is nauseous, so that children and delicate persons refuse to swallow it. It has been proposed to substitute for carbolic acid its soluble salts—the carbolates—but these are themselves objectionable from their nauseous taste, and M. Lemaire advances against them the all-sufficient objection that they are very unstable compounds.

9. The double salts, which I am about to describe present none of the practical difficulties before mentioned. Containing in each equivalent one equivalent of carbolic acid,

they manifest the same effects as the agent itself, and, as I shall presently show, they are capable of the most ready administration and complete absorption. It had been known that equivalent weights of carbolic acid and sulphuric acid combined to form a stable sulpho-carbolic acid, which presented some analogies with sulpho-vinic acid. My friend Mr. Crookes succeeded, by neutralizing this acid with potash, in producing a crystalline salt—sulpho-carbolate of potassium. To Mr. Crookes, undoubtedly, belongs any merit that may attach to the inauguration of this inquiry. From the ready solubility and not unpleasant taste of the sulpho-carbolate of potassium, I thought with him that it afforded an indication towards the discovery of a valuable practical antiseptic for internal administration.

10. I then devoted myself to the preparation and investigation of the various sulpho-carbolates of the alkaline and metallic bases, and I have now succeeded in producing a series of definite double salts. In the prosecution of the inquiry I have to acknowledge the valuable aid which I have received from Messrs. Balmer and Child. We prepared the sulpho-carbolates of the alkalies in September, 1867. The sulpho-carbolate of zinc was obtained by us in a state of great purity in July, 1868, and we have recently succeeded in preparing the sulpho-carbolates of copper and of iron.

Sulpho-carbolate of sodium ($C_6H_5, NaSO_4 + Aq$) may be obtained in fine rhombic prisms, colourless, having a slight taste of creosote. The crystals have a characteristic tendency to cohere in the form of minute rosettes. The salt is very soluble in alcohol and in water; it is immediately dissolved by six times its bulk of cold distilled water.

Sulpho-carbolate of potassium crystallizes in oblique rhombs.

Sulpho-carbolate of ammonium is obtained in the form of rectangular plates.

Sulpho-carbolate of magnesium is in appearance an amorphous powder; under a lens it is seen to be a congeries of acicular crystals.

Sulpho-carbolate of zinc, (C_6H_5) Zn″ (SO_4) + Aq, forms

beautiful clear, colourless, rectangular plates of an unusual brilliancy.

Sulpho-carbolate of copper forms long needle-shaped crystals of a pale green colour, the hue much resembling that of sulphate of iron.

Sulpho-carbolate of iron is apparently a dull red-brown amorphous powder, with here and there lustrous scales which, examined by the microscope, present the form of square plates of a ruby tinge. Its aqueous solution is of a beautiful mauve or purple colour. This appearance affords an excellent test for the presence of sulpho-carbolic acid; a drop of solution of perchloride of iron added to a solution of a salt of sulpho-carbolic acid, developing at once the characteristic colour.

I have been able by this test most readily to detect the presence of one sixtieth of a grain of sulpho-carbolate of sodium.

11. It became my object to determine which of the sulpho-carbolates of the alkalis was most effectual as an antiseptic. As an example of the development and multiplication of organized germs in which a comparative test could be applied I chose fermentation, because its phenomena have been accurately studied and are capable of a close demonstration. I proceeded as follows: I procured a series of glass bottles of exactly the same capacity; the mouth of each was closed by a cork through which passed a narrow glass tube the extremity of which in the interior of the bottle reached nearly to the bottom. Into each of the series were weighed fifty grains of cane sugar and afterwards a bulk of yeast exactly equal in each; one of the bottles was now filled with water; into each of the remaining bottles twenty grains of one of the alkaline sulpho-carbolates were introduced. The corks and tubes being now adapted to each, the bottles were immersed into a vessel of water at 100° Fahr., and kept with no disturbance of the conditions for nine and a half hours. It is obvious that on the occurrence of fermentation, carbonic acid would collect in the upper part of the bottles, and driving out the contained fluid through the tube would

produce a displacement just in proportion to the amount of fermentation. Though this experiment, therefore, could not pretend to a rigid and absolute accuracy, it was, owing to the conditions being identical in each case, a satisfactory comparative test of the power of the different agents in restraining the fermentation. At the end of the time mentioned it was found that from the bottle in which no antiseptic had been introduced the fermentation had displaced the whole of the contained fluid. In each of the others fermentation had occurred imperfectly, but in different degrees; the spaces in each bottle being filled from a graduated burette, a series of comparative results were obtained. Confirmatory experiments agreed in establishing the following as the order of efficiency as regards prevention of fermentation in the various cases:—1. Sulpho-carbolate of sodium; 2. sulpho-carbolate of magnesium; 3. sulpho-carbolate of potassium; 4. sulpho-carbolate of ammonium. It was established that twenty grains of sulpho-carbolate of sodium would completely annul the fermentation of fifty grains of sugar; the last two of the series were far less efficient. The result of this preliminary experiment, therefore, established the superiority of the sodium salt, which also had the advantages of a ready solubility and a taste less unpleasant than that of any of the others; I therefore chose it for internal administration.

12. To test the effects of this salt upon the lower animals, I administered it to two guinea-pigs; it was given in the form of pills made up with a sufficiency of arrowroot; no other food was given. From May 1st to May 5th the two guinea-pigs took 275 grains of sulpho-carbolate of sodium. It produced no obvious effect except a slight looseness of the evacuations. The animals being killed and examined after death, there was found to be no morbid lesion, but the duodenum of one contained an unusual quantity of yellow bile. The bodies were sent to Mr. Henry Child for chemical examination. He reported that the contents of the stomach, the intestines, the substance of the livers, the contents of the bladders, and the whole of the muscular system yielded a

crystalline substance answering to the tests for soda and sulphuric acid, but carbolic acid was not evident to tests. The salt, therefore, was manifest in the economy as sulphate of sodium. Comparing the conditions of the fleshy portion of the leg of one of the guinea-pigs with a piece of freshly-killed lean mutton, the observation being commenced on May 5th, Mr. Child made the following notes:

May 19th.—Piece of meat tainted, damp on outside, and softening in structure.

Leg of guinea-pig, dry on outside, but no other apparent difference.

May 30th.—Piece of meat putrefying, and smelling very badly; had to throw it away.

Leg of guinea-pig without any smell, but almost dried up.

June 8th.—Leg of guinea-pig quite dry, no other change.

13. Having found that twenty grain doses were taken by the human subject with no ill effect whatever, I increased the dose in several cases to sixty grains, administered every four hours. The only direct effects were a slight tendency to vertigo or dizziness. The odour of carbolic acid could be readily detected in the breath. The urine of a patient who had taken 360 grains of sulpho-carbolate of sodium in twenty-four hours was collected and examined. It gave no evidence of the presence of carbolic acid, but contained a considerable quantity of sulphate of sodium. It showed a marked tendency to resist putrefaction.

14. Taking without selection thirty-five cases of phthisis to whom I administered sulpho-carbolate of sodium in twenty-grain and thirty-grain doses, I endeavoured to ascertain if it possessed any special effect upon general health and nutrition. Of the thirty-five cases, four were in the first stage of the disease, twenty-five in the second stage, and six in the third.

The treatment was for the most part continued for two months, the ordinary dietetic and tonic means being adopted in addition. Concerning these thirty-five patients, the following points were noted:

I. *Evidence of symptoms directly produced by the drug.*—

These were only manifested in four out of the whole number. One stated that the "medicine made him feel nervous," but declared there was improvement, both in breathing and in general strength. A second suffered severe headache, and the treatment was omitted. A third, a young female with disease in the third stage in both lungs, stated that "the medicine made her feel stupid and useless for a few minutes," but her general strength improved. A fourth said that the immediate effect was to make her feel powerless, but she became better and more cheerful.

II. *Influence on general health.*

A. 13 cases manifested great improvement.
B. 15 ,, ,, considerable improvement.
C. 5 ,, ,, no advantages.

In class A three patients stated that "they felt quite different men;" all testified to a great improvement, and these assurances were corroborated by signs of obvious improvement and by decadence of the signs of disease.

In class B the effects attested were—1, increase of strength; 2, decrease of cough; 3, arrest of fœtid expectoration; 4, improved rest; 5, increased appetite; 6, arrested night perspirations.

In class C one was a case of acute phthisis, in which the medicine was frequently vomited; the second coexisted with great hypochondriasis, and vomiting was a prominent symptom; in the third there was marked hysteria, and no improvement was manifested; in the fourth the disease progressed without any change for the better; and in the fifth the drug was omitted on account of headache.

III. *Influence of nutrition.*—There were in cases of fifteen patients whose weight was recorded—

A. Gain of weight in 9 cases.
B. Loss of weight in 6 cases.

A. The increase of weight was 1 lb. in four cases, $2\frac{1}{4}$ lb. in one, $3\frac{1}{2}$ in two, 4 in one, and $5\frac{1}{2}$ in one; an average gain of $2\frac{1}{2}$ lbs.

B. The decrease of weight was, in three cases, from $\frac{1}{2}$ lb.

to 1½ lb.; in a fourth case 3 lbs. (very extensive disease of both lungs); in a fifth a decrease of 4 lbs. in weight was manifested coincidently with improvement in signs and symptoms; whilst in the sixth case the loss was 6 lbs., and the drug was omitted on account of sickness.

15. After a review of these cases I think it can be scarcely denied by any of those conversant with pulmonary disease that they bear a favorable contrast with similar cases placed under any other circumstances, however favorable. Without claiming for the salts, however, any undue advantages, we are, at least, justified in concluding—that the sulpho-carbolate of sodium, in doses amounting to sixty grains per diem, may be taken in the great majority of cases by patients in delicate health for a period of two months without the production of any deleterious effect whatever.

16. Concerning the operation of the sulpho-carbolate upon the economy, we can conclude that it is absorbed and then decomposed within the body into sulphate of sodium which is voided by the urine and carbolic acid which is exhaled by the lungs. Whether or no the carbolic acid is also in part excreted by the urine is undetermined; but it is certain that a marked influence is produced by the treatment upon that secretion—a fact proved by the extraordinary preservation of the latter from putrefaction. Although the tissues of the animal body do not disclose to tests the presence of carbolic acid, it is certain that they have undergone some potent change whereby they are preserved from decomposition. It is possible that the germs whose development in the dead body gives rise to the phenomena of putrefaction can obtain no vitality in tissues wherein carbolic acid is present.

17. Taking into consideration (1) that, as established by a multitude of observations, carbolic acid is a powerful agent for the destruction of organized germs, (2) as I think the foregoing observations afford sufficient evidence, the sulpho-carbolate of sodium is a practical and efficient vehicle, whereby carbolic acid can be conveyed to the tissues of a living animal. I consider that an *à priori* case is made out for the treatment of zymotic diseases (*i. e.* those diseases whose manifesta-

tions are considered to be due to the operation of organized germs) by the sulpho-carbolate of sodium.

18. As to the success which has hitherto attended the application of these principles, I desire to speak with great reserve. I have myself employed the sulpho-carbolate of sodium as an internal remedy in a large number of diseases of the zymotic class (including diphtheria and very severe scarlet fever) during twelve months. I have had no case which has terminated in death or in any untoward complication. I consider, however, that any individual experience is of the least possible value in the elucidation of the question of the value of the treatment in cases of zymotic disease. Such a question can only be determined by the accumulation of data, and especially by the employment of the remedies in the organized departments of the State.

A CASE ILLUSTRATING THE PHYSIOLOGY AND PATHOLOGY OF THE CERVICAL PORTION OF THE SYMPATHETIC NERVE.

BY

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Received Jan. 29th.—Read March 23rd, 1869.

Our knowledge of the functions of the cervical sympathetic is derived almost exclusively from experiments on animals, man himself having furnished very few data, pathological or experimental. I cannot, therefore, but hope that the case which I have now to bring forward will be found one of great interest; for the symptoms observed in it will, I think, satisfy physiologists that the sympathetic nerve had either been cut through on one side of the neck, or, if not actually divided, yet so disorganised as to amount practically to the same thing.

It will perhaps be well before I narrate my case, to recall briefly the chief observations which have hitherto been made on this nerve in man.

So far as I have been able to ascertain, there are only two

cases on record in which the symptoms observed during life led to the conclusion that the cervical sympathetic had been severed.

In one case, a surgeon in removing a tumour from the right side of the neck apparently divided the nerve. Next day the face on that side was deeply congested, and marked with well-defined patches of a violet red. The right pupil was contracted; the conjunctiva normal. No observations were made as to the temperature.[1]

The second case is of more importance. An American soldier in the course of the late war was shot through the neck with a bullet. Two months after he had been thus wounded he came under the notice of Messrs. Mitchell, Morehouse and Keen, who have recorded his case in their work on gunshot wounds (p. 39). The pupil of the right eye was very small, that of the left eye unusually large. There was slight but distinct ptosis of the right eye, and its outer angle seemed to have dropped a little lower than the inner angle. The ball of the right eye seemed smaller than that of the left, and its conjunctiva was somewhat redder. The pupil was not only contracted but slightly deformed, oval rather than round. In a dark place, or in half lights, the difference in the pupils was best seen; but in very bright light the two pupils became nearly of equal size. The left eye watered a good deal, but had the better vision, the right eye having become myopic. He complained of frontal headache, of loss of memory, and of red flashes in his right eye when exposed to the sunlight, and also, after long exposure, in the left eye. With all this there were no abnormal retinal appearances. The patient's face presented a curious appearance after walking in the heat. It became distinctly flushed on the right side and pale on the left. The flush extended to the middle line, but was less definite as to its limits on the chin and lips than above these points. Unfortunately no thermometric examination was made, while the man was thus flushed with exertion; but careful examination made *during repose*, showed no difference in the heat of the two sides

[1] 'Gazette des Hôpitaux,' No. 64, 1868.

within the mouth or ear. The man improved under a tonic treatment. The eyes became less sensitive, the pupils more nearly alike, and the line of the lid straighter. In three months' time nearly all his peculiar symptoms had disappeared, and he returned to his duty.

By the side of this case may be set the following experiment.

In 1859, a woman was beheaded at Wurzburg. As soon as the axe had fallen, the head was wrapped in hot cloths and carried off to the neighbouring theatre of anatomy, where Prof. Wagner with a number of physiologists and students was awaiting it.[1] Eighteen minutes only had elapsed since the moment of decapitation, when a magneto-electric current was applied to the left cervical sympathetic at the point where it had been exposed by the axe, an inch and a quarter below the superior ganglion. Some four or five seconds passed, and then the left eye slowly opened and its pupil was seen to dilate widely. Already a year earlier Prof. Wagner had made a similar experiment on the head of another criminal and with similar results.

If to this experiment of Professor Wagner and to the two cases previously cited be added numerous instances of ptosis and of altered pupil coincident with cervical tumours,[2] and possibly due to pressure on the sympathetic, we have all the main observations made on the action of this nerve in the human body. To these scanty data, I would now contribute the following addition.

J. R— served his full time as soldier. During that time he drank hard and lived loosely, and suffered in consequence from delirium tremens and repeated chancres. Nearly three

[1] Cf. Brown-Séquard's 'Journ. de Physiol.,' iii, 174.

[2] For a collection of such cases see a paper by my namesake Dr. John Ogle, in 'Med.-Chir. Trans.,' vol. xli. In one of these cases, described by Dr. Gairdner, there was not only contracted pupil but "a remarkable irregularity of temperature—cold sweats followed by flushing, accurately limited to that half of the face on which the pupil is affected." Dr. Gairdner has seen another similar case. (Cf. p. 413.)

years ago a hard lump formed on the right side of his neck, and not long afterwards the whole arm on that side became enormously swollen. This swelling soon disappeared, but the lump on the neck grew larger and suppurated; and thus an abscess was formed which took many months to heal. While this was going on, about two years ago, his wife noticed that his right eye appeared smaller than the left one; and also that the right ear was redder than its fellow. On looking at the glass he found that such was the case, and so it has remained ever since. He soon also noticed that the right side of the face, and especially the right ear, felt hotter to him than did the left; and this he says is more particularly the case when he washes his face with cold water in the morning. These symptoms concerned him so little, that he has never mentioned them to a doctor, and they were only noticed by accident while he was under treatment for certain nocturnal pains, which yielded readily to iodide of potassium.[1]

On examining the patient I found a large puckered scar on the right side of the neck, running in a transverse direction and extending very nearly the whole way from the clavicle in front to the median line behind. In the neighbourhood of the scar some hard nodules, doubtless indurated glands, could be felt, and there was some dulness on percussion under the clavicle. The formation in the neck had evidently compressed the large vessels of the arm, for no pulse could be felt either in the brachial or in the radial artery. The blood, moveover, returned from the arm by the superficial veins, which were large and tortuous, and ran from the arm over the upper front of the thorax till they dipped down out of sight above the clavicle. The arm itself was well nourished and fairly muscular. The swelling of the arm at the time when the lump was forming in the neck had doubtless been œdema caused by pressure on the vessels, and its subsidence was due to the establishment of new

[1] J. R— was originally a patient of Dr. Dickinson's. He came into my hands while I was doing Dr. Dickinson's hospital work in his absence. I obtained Dr. Dickinson's permission to make use of the case.

channels for the ingress and egress of the blood. The pulse could be felt distinctly in the carotid artery.

The palpebral fissure of the right eye was much narrower than that of the left. This was partly due to a lowering of the upper lid, partly to an elevation of the lower one, and perhaps rather more to the latter than to the former cause. Notwithstanding the apparent ptosis there was perfect voluntary control over the upper lid. The patient when asked to open his eyes widely, raised the two upper lids equally well. There was, however, even then a marked difference in the size of the two palpebral fissures, owing to the different levels at which the lower lids stood. The eyelids also followed perfectly the motion of the eyeball when the patient was directed to look upwards or downwards.[1] Excepting the narrowing there was no deformity in the fissure, and no drooping of the outer angle, such as was observed in the American soldier, and has been frequently seen as a result of section of the cervical sympathetic in animals.

The right eyeball was somewhat retracted; that is, it lay deeper in its cavity than did the eye on the other side. The muscular motions of the eye were perfect.

The right pupil was very much contracted. When the patient looked towards the light, the diameter of this pupil was scarcely more than half that of the left; when the eyes were shaded the difference was still greater. The contracted pupil reacted to the light, but slowly and within very narrow limits. When a solution of atropine was dropped into the eyes, both pupils dilated largely, and the inequality of size entirely disappeared. It returned so soon as the effect of the atropine had passed off. With calabar bean both pupils contracted considerably. The right was reduced to a mere

[1] I mention this fact because of its possible bearing on the theory which attributes "exophthalmous goitre" to some lesion of the cervical sympathetic. In that curious disease the upper eyelid does not follow the upwards and downwards motion of the globe, or follows it imperfectly, as was first pointed out by V. Gräfe. V. Gräfe thinks that goitrous exophthalmia may be distinguished by this symptom from other forms of exophthalmia. Cf. 'Archiv für Psychiatrie, &c.,' 1868, p. 444.

point or little more; the left, though much contracted, was not so small as this.

The conjunctiva in both eyes was somewhat congested, and that of the right eye rather more, but not much more, than that of the left.

On ophthalmoscopic examination, which Mr. Power was good enough to make for me, it was found that the media were perfectly clear. There was slight central excavation of the optic disc in either eye; and in both the apparent outer portion of the disc was pinker than the inner portion. There was no visible difference in the size of the central vessels nor in the general vascularity of the two retinæ. The sight was good, and equally good on the two sides.

The ear on the right side was much redder than the ear on the left; and sensibly warmer to the hand. The skin of the right cheek, and the skin just above the right eye were also sometimes, but not always, pinker than the corresponding parts on the left. This seemed especially the case when the man was slightly flushed with *gentle* exercise; though as will be seen presently it was not the case when *violent* exercise was taken. The right temporal artery was more prominent than the left; but no difference of colour was visible on the two sides, excepting in the parts already mentioned. The difference of colour in the two ears, and of heat as measured by the hand, was much increased by applying ice to them for a short time. Both ears became paler and colder from this application, but the left much more than the right. The patient was misled by this increasing difference of temperature, to say several times during the refrigeration that his "right ear was getting hotter and hotter." So also he stated that his right ear was always hottest when he washed his face with cold water in the morning. When hot water was applied for a time to the ears, both became redder and warmer, and all apparent difference between them—as measured by touch and sight—disappeared. Of the repeated thermometric observations made later on this man, it will be enough to give a single sample; for, excepting under the conditions to be presently mentioned, the result was always

the same; that is, the right side of the face was invariably hotter than the left. Here then are the results obtained one morning when the man was in fairly good health, and had not taken exercise.[1]

	Right.	Left.
Nostril	98·2 ...	97·2
Ear	95·6 ...	93·6
Mouth under tongue...	98·8 ...	98·2

Notwithstanding the greater vascularity and the higher temperature of the right side, the man asserted that he only sweated on the left side of his face; that when he walked in the wind his left eye alone watered; that though abundant mucus was discharged from his left nostril none ever came from his right one; and lastly that the right side of his mouth often felt drier to him than the other, and that so dry altogether was his mouth that he was obliged for comfort to take acid drops so as to promote the flow of saliva. This seemed so strange, and so opposed to all that one would have expected *à priori*, that at first I thought the man must be mistaken. I got him, however, to put on an extra coat and to run round the park till he was thoroughly heated. On his return I found the left side of the face, head, and neck, bathed in sweat; the whiskers and hair on that side were dripping, and the shirt-collar soaked through. The corresponding parts on the right side were perfectly dry. The line of demarcation between the wet and the dry skin was exactly in the centre of the forehead in front, and ran vertically over the crown of the head to the centre of the neck behind. I wiped the face till it was dry, and in a few minutes the sweat again appeared on the left side; and with the same rigid line of demarcation. Both legs and both sides of the body were sweating equally. The thermometer now gave the following results:

	Right.	Left.
Nostril	96·5 ...	98·
Ear	93· ...	94·4

[1] The temperature of the nostrils was taken inside the cavity. The temperature of the ears by placing the bulb of the thermometer between the lobule and the side of the head, and keeping the lobule closely against it.

It thus appeared that violent exertion had inverted the relative conditions of the two sides of the face. When the man was at rest the right side was the warmer of the two; when he had exerted himself it was the colder. This was the more extraordinary, because, as I have before mentioned, a slighter amount of excitement seemed often to increase the vascularity of the right side and to deepen the contrast between it and the left.

I repeated the above experiment on more than one occasion, and always with a similar result. Invariably after violent exertion the left side of the face was the hotter; while invariably, with one single exception, the right was the hotter when the man had remained quiet, and had not been exposed to any extraordinary conditions. The single exception was this. I found one morning the two ears equally warm, the thermometer giving 95° for each. The pulse was rapid, the skin hot, and the man complained of feverishness, for which he accounted, and probably correctly, by his having sat up the greater portion of the preceding night. The man's health has been so equable that I have had no opportunity yet of repeating this observation. So far, however, as it goes, it would seem to show that feverishness tends to act in this man in the same way as violent exertion and to invert the thermometric conditions of the two sides.

I was anxious to know what would be the effect of exposure to a high temperature. I therefore got the man to take a Turkish bath. He remained in the hot-air chamber for an hour and a half. During the whole of this time not a drop of moisture appeared on the right side of his face, head, or neck, though the corresponding parts on the left and all the rest of his body were bathed in sweat.

As my patient was thus accurate in his statement as to the sweating, and is an intelligent straightforward man, we may, I think, assume that his further statements as to the secretions of the eyes, nostrils, and salivary glands were also accurate. My attempts to verify these came to little. On holding ammonia in front of his face, at an equal distance from the two eyes, lachrymation was produced on both sides.

It began, however, in the left eye, and seemed more copious on that side than on the right. When the surface of the tongue was moistened with ether abundant salivation was produced, and I am unable to say that it was more copious on one side than the other. Both ears contained much cerumen, and, as far as I could judge, in equal amounts.

The remaining symptoms presented by this man were of comparatively slight importance. There was no increase of sensibility, special or general, on the right side; no apparent nutritive alterations; no change of shape in nostril or in mouth, such as Bernard[1] has noticed in some animals. The pulse was rapid, never below 90. There was a little husky cough, but the voice and respiration were quite normal. There was occasional frontal pain, of no great severity, on the right side. The intelligence was good, though the patient said that lately his memory was weaker than it had been.

Such were the symptoms. To what were they due? I think there can be no doubt that they were the result of lesion of the right cervical sympathetic, and of a lesion which was equivalent to division of that nerve. For all the phenomena can be explained on that hypothesis, and as far as I can see, on no other. At the same time that I was watching this man I had under observation some rabbits in which the cervical sympathetic had been cut on one side. The symptoms presented by these rabbits—the well-known symptoms described by Bernard, Brown-Séquard, and others—were identical with those presented by this man, and rabbits or man served equally well to demonstrate to a class the effects of this operation. The symptoms might, indeed, be explained theoretically by supposing disease to have implicated that portion of the spinal cord from which the cervical sympathetic has its origin. But such disease would inevitably have betrayed itself in the course of two years by other signs of spinal disease. It will be remembered, also, that the symptoms dated from a time when there was a deep abscess in the neck. I suppose that this abscess had eaten through, or, at any rate, thoroughly disorganised the nerve, and this

[1] 'Système nerveux,' t. ii, 473.

probably not only at one small spot, but for some little distance, so as to prevent reunion. That the consequent hyperæmia should have persisted so long is somewhat remarkable: for, as a rule, this symptom is of comparatively short duration in animals. In rabbits, for instance, according to Bernard,[1] the hyperæmia is scarcely discernible after fifteen or eighteen days from the time of section. It is very temporary also in the horse and in the guinea-pig. In the dog it lasts longer, but seldom for more than six weeks or two months. Still these results are not invariable. I have now a rabbit in which the hyperæmia still persists, though in diminished intensity, eleven weeks after section; and on one occasion Schiff saw the hyperæmia persist in a dog two entire years without any great diminution.[2]

I pass on now to make a few remarks on the more notable symptoms presented by my patient, and to compare them with the results obtained experimentally in animals. And first of the eye.

The eyeball was somewhat retracted, that is, lay deeper in its socket than did the eye on the opposite side. This is a phenomenon which always occurs after section of the cervical sympathetic in mammalia; while the contrary movement, viz. protrusion, follows on galvanisation of the nerve. In this man the retraction was certainly as considerable as that which occurs in rabbits. I insist upon this, because in the experiment made by Wagner on the criminal's head, no motion of the eyeball occurred on galvanisation of the sympathetic. In the case of the American soldier, it is not expressly stated that the eye was retracted, but inasmuch as the eyeball seemed smaller on the affected side than on the sound one, it is very probable that there was, in reality, some retraction.

The retraction and protrusion of the eyeball have been variously interpreted by physiologists. The real explanation, however, seems to be that which was originally put forward[3]

[1] 'Syst. Nerv.,' ii, 492. [2] Schiff, 'Leçons sur la Digestion,' i, 258.

[3] Brown-Séquard's 'Journ. de Phys.,' 1860, p. 176. "Sur un muscle lisse de l'orbite de l'homme et des mammifères."

by H. Müller on theoretical and anatomical grounds, but which has recently received its experimental confirmation at the hands of M. Prevost.[1] Müller discovered, in the orbital cavity of mammalia, a funnel-shaped layer of smooth muscular fibres, provided with elastic tendons (musculus orbitaris), and so arranged as to be capable by their contraction of propelling the eyeball forward in its socket. This smooth muscle receives filaments from the cervical sympathetic. M. Prevost has recently experimented upon this muscle, and found that direct galvanisation of it in dogs causes protrusion of the eyeball, as Müller had supposed.[2] He also found that when this muscular layer was completely divided, no motion of the eyeball[3] could any longer be produced by galvanising the sympathetic. The proof then is complete, that it is through the agency of this muscle that the protrusion is effected by the sympathetic. The retraction of the eyeball is produced partly by the relaxation of this funnel-shaped muscle, and more completely, in such animals as possess it, by the striated retractor muscle. Now in the human[4] orbit

[1] "Recherches sur le ganglion sphenopalatin," 'Archives du Physiol.,' 1868, p. 221, &c., and 'Comptes Rendus,' 1867, p. 849.

[2] In one particular Prevost's experiments are in opposition to Müller's views. Müller thought that the sympathetic filaments which govern the orbital muscle reached it through the sphenopalatine ganglion. Prevost has shown that this is not the case. For protrusion of the eyeball is produced by galvanising the cervical sympathetic, even when the sphenopalatine ganglion has been previously destroyed.

[3] That the membrana orbitaris was muscular was the opinion of older anatomists, though this opinion had been discarded long before Müller's discovery. Neither was it a novelty to attribute the protrusion of the eyeball to this membrane. Thus in Wagner's 'Elements of Comp. Anat.' (Tulk's translation, p. 25) we find, "It is only in the Apes that the eye is situated, as in Man, in a complete bony cavity closed both from without and within; in all the rest of the mammalia, and also in the Makis, the orbital and zygomatic spaces blend upon the sides of the skull. Both spaces are, nevertheless, separated by a peculiar membrane, which is called the orbital membrane, *and was formerly regarded incorrectly as muscular;* it arises from the periosteum, lines the orbits funnel-wise, and consists partly of elastic tissue. *It seems to act as an antagonist to the retractor muscle of the globe of the eye, protruding or pushing the eyeball forward so soon as the action of that muscle ceases.*"

[4] This smooth orbital muscle of the human eye was discovered, inde-

a similar orbital muscle is found, but a much less perfect one than exists in those mammalia whose orbital cavity is less completely surrounded with bone. In man moreover there is no retractor muscle. It is, therefore, only natural to expect that the motion of the globe forwards and backwards should be less strongly marked in man than in many animals. Whatever, however, may be the case as regards protrusion, my case shows that a considerable retraction can occur.

The palpebral fissure was considerably narrowed. This is a constant result of section of the sympathetic in mammals, while galvanisation of the nerve as constantly produces dilatation of the fissure. The fissure was narrowed also in the case of the American soldier; while, in the experiments of Wagner, the closed eye was made to open by galvanising the nerve. As these motions are produced by the agency of the sympathetic we cannot attribute them to the striated levator palpebræ muscle, for there is no known instance in our body of the motions of striated voluntary muscle being directly governed by sympathetic fibres. Müller[1] consequently explains the phenomena by the contraction and relaxation of certain smooth muscle fibres, which are found in both lids, but in greater abundance in the lower than in the upper one; an explanation which is in accordance with the fact that the diminution of width is due rather more to a raising of the lower lid than to a depression of the upper one. It is consistent also, as Wagner observed,[2] with the fact that the opening of the lids which follows on galvanisation of the sympathetic is produced slowly, and persists for some little time after the galvanisation has been discontinued. These characters belong to the contraction of smooth and not to that of striated muscular tissue.

pendently of Müller's previous discovery of it, by Prof. Turner, and described by him in the 'Natural Hist. Review,' January, 1862, "On a Non-Striped Muscle connected with the Orbital Periosteum of Man and Mammals." It has been more recently investigated by M. Sappey, and described by him in detail, 'Comptes Rendus de l'Acad. des Sciences,' 1867, p. 675.

[1] Brown-Séquard, 'Journ. de Phys.,' iv, 279.

[2] Ibid., iii, 176.

The pupil was contracted. This again is a well-known result of section of the cervical sympathetic, and has also been seen repeatedly in man when there was reason to suspect pressure on the nerve. There was, however, in my case one peculiarity which deserves notice. When a solution of atropine was dropped into the eyes, both pupils dilated fully—the right as much as the left—and all inequality of size vanished. In experiments made on animals this has not been the case. The pupil on the side of the section has been found to enlarge, but not so widely as the pupil on the opposite side.[1] Why there should be this difference in the cases of man and of animals I am unable to conjecture, but of the fact there can be no doubt. I repeated the experiment more than once, and each time with the same result. It has been argued by various writers that the dilatation by atropine of the pupil, after it has been contracted by section of the sympathetic, is a proof that atropine acts not simply by paralysing the circular fibres of the iris, but by stimulating its radial fibres. But an objection to this argument has always been possible hitherto. For it might be urged that, as the dilatation was only slight, and not nearly so complete on the injured as on the uninjured side, it was simply due to the elasticity of the iris, which was now no longer kept in check by the sphincter muscle. No such objection can be made in the case of my patient. The dilatation was as complete on the one side as on the other, and so great that it is out of the question to refer it to mere elasticity.

Before leaving the eye, I would make a few remarks on the condition of the retina. This was examined with the greatest care many times, and no hyperæmia whatsoever could be detected in it. The vascularity was not greater in one retina than in the other. Neither was there any morbid sensitiveness to light. On the contrary, the man was remarkably tolerant of long-continued ophthalmoscopic examination, and the tolerance was as great in one eye as in the other. This, I think, disposes of the opinion held by some

[1] Valentin, 'Versuch einer physiol. Pathologie der Nerven," ii, 156, and Ludwig, 'Lehrbuch der Phys.,' p. 282.

physiologists, that the section of the nerve "operates simply by exaggerating for a time the sensibility of the retina, as it does that of the integument, and that the partial closure of the eyelids and pupil is a secondary consequence of that condition."[1] For here there was neither hyperæmia nor exaggerated sensibility; yet the lids were partially closed and the pupil contracted. There may, indeed, have been hyperæmia at an early period, when the lesion was recent; but if so it had entirely passed away, and with it should have gone the other symptoms, were they really dependent thereon. On searching through books to find what has been the observed condition of the retina in animals, after section of the cervical sympathetic, I was surprised to find no information whatsoever.[2] The great experiments were made before the ophthalmoscope came into use; and the hyperæmia of the retina has been rather a matter of inference than of direct observation. It must not, however, be assumed that because there is hyperæmia of the skin, of the conjunctiva, and of other parts, that there is also necessarily hyperæmia of the retina. For Schiff has shown that by no means are all the vaso-motor nerves of the head contained in the cervical sympathetic; and thus it might be that those of the retina passed by some other channel. I thought it well, therefore, to examine into this. Mr. Power carefully examined for me the ophthalmoscopic appearances in two rabbits, in which the cervical sympathetic had been divided on one side. In both there was considerable hyperæmia of the retina on the side of the section. How rapidly the hyperæmia occurs is shown by the following observation on a third rabbit. This animal was put under chloroform, and the nerve cut on one side of the neck. The animal died from chloroform, without recovering consciousness. On dissecting out the eye, the retina on the side of the section was found quite pink from the dilatation of its vessels, while the retina

[1] Dalton's 'Physiology,' 3rd ed., p. 523.

[2] An ophthalmoscopic examination was made in the case of the American soldier quoted at the beginning of this paper, and no abnormal retinal appearances discovered.

of the opposite eye was colourless. Either, then, there is a difference between man and rabbits, as regards the vaso-motor arrangements of the retina, or, as is perhaps more probable, retinal hyperæmia had been present in my patient at an earlier period, but had subsided in the course of the two years which had elapsed since the nerve lesion.

So much for the phenomena presented by the eye. It remains to consider the condition of the rest of the face.

The right side of the face was redder and hotter than the left. This at least was the state of things when the man was in good health and tranquil. The symptom is, of course, accounted for by the palsy of the circular muscles of the blood-vessels and the consequent hyperæmia. That the difference should have increased with slight excitement is not surprising. The excitement would cause increased heart action, and the slightly enlarged vessels of the right side would admit more blood than the sound vessels of the left. What, however, is astonishing is that violent exertion should have had just the opposite effect, and should have inverted the relative conditions of the two sides, raising the left, or sound side, to a higher temperature than the injured side, and inducing secretion on the former alone.

Strange, however, as this seems, it is after all what occurs in animals after unilateral section of the cervical sympathetic, as was discovered not very long ago by Schiff.[1] Schiff had cut the cervical sympathetic on one side in a dog. The wound had healed some time, and the dog was in good health, and presented no other notable symptom than the permanent hyperæmia of the ear on the side of the old operation. One day, while the dog was in this condition, Schiff happened to examine its ears after it had been running about and had got much heated. To his surprise, he found the ear on the sound side, which was usually the colder and the paler, now the more vascular of the two; when the dog had cooled down, the original condition returned, and the ear on the side of the section became again the warmer. This

[1] Schiff, op. cit., p. 259.

observation led to experiments, which showed that any form of general excitement, such as exercise, emotion, or fever, inverts the thermometric and vascular conditions of the two sides, after unilateral section of the cervical sympathetic.

I have since made numerous experiments in imitation of those of Schiff, and with results corroborative of his statement. Some few of these I will describe briefly.

Exp. 1.—The cervical sympathetic was cut on the right side in a rabbit. The ordinary symptoms resulted. The right ear was much the more vascular and the hotter to the touch. Two days after the operation, and while this condition remained, I placed the rabbit in a hot-air chamber, keeping the temperature at about 120° F. The rabbit remained in this for more than an hour. It was then in a state of considerable excitement, and its heart was beating with much greater rapidity than at the commencement of the experiment. Its left ear was now found to be 1½° F. hotter than the right one. The experiment was repeated several times, the rabbit being replaced in the intervals in the hot chamber, and each time the result was the same; the difference of temperature varying from 1·2° F. to 2·4° F., but being invariably in favour of the left or non-operated side.

Exp. 2.—The right cervical sympathetic was cut in a rabbit. The right ear after this was 8° F. hotter than the left. Twelve days later the difference between the two ears was so slight that it was barely appreciable to the hand. The rabbit was now hunted about a room, till it was very excited and hot. The left ear after this was found to be nearly 2° F. hotter than the right one. I then applied ice to the ears, taking great care that both should be exposed equally to its action. The temperature sank rapidly, and the right ear was found to be 3° F. hotter than the left one.

Exp. 3.—The left cervical sympathetic was cut in a rabbit, and the ordinary results obtained. Some days afterwards the left ear was still more vascular and warmer than the right. The ears were pulled and rubbed briskly. After this the right ear was found to be much the more vascular of the two, and no difference of temperature was perceptible to

the touch. This inverted condition of the ears lasted for a very short time.

Similar results were obtained by Schiff by injecting pus into the veins, and producing artificial fever. This I have not repeated. But it will have been noticed in the history of my patient that on one occasion I found his left ear equally hot with the right one, and this though he had not taken any violent exercise. He had, however, sat up half the preceding night, and was in a feverish condition. Had the febrile condition been more severe, very probably the left ear might not merely have equalled, but have surpassed the right in warmth.

Besides heat, violent exercise, and fever, there are other conditions which can invert the relative conditions of the two ears after unilateral nerve section. Thus Bernard found that when chloroform was given to dogs, the ear on the non-operated side became the warmer at the moment of insensibility.[1] I have twice repeated this experiment on rabbits, but without a similar result. The operated side in such case retained its excess of warmth over the other. It may be that dogs and rabbits differ in this respect, or it may be that the rabbits I used were exceptional. For no one can make many experiments on the sympathetic in rabbits, without finding that there are considerable differences in the phenomena presented by different individuals of the species, and especially that the phenomena vary with the length of the ears.[2]

Again, in rabbits a temporary inversion may occur independently of any apparent external influence or internal fever, as the following observation shows.

Exp. 4.—I cut the left cervical sympathetic in a rabbit with long pendent ears. Shortly after the section the usual results were noted in the left eye, and the left ear was much more vascular and 8·5° F. hotter than the right one.

[1] 'Syst. Nerv.,' ii, 503.

[2] It would appear from an observation made by Kussmaul ('Einfluss der Blutströmung,' &c., 42) that even the colour of rabbits is a matter not to be neglected in experimental physiology.

Two days later I was surprised at finding the conditions inverted. The right ear was much the more vascular, and sensibly warmer to the hand. I imagined that the wound must have inflamed, and that the inversion was the result of fever. The wound, however, seemed perfectly healthy, and no febrile symptoms could be detected. After examining the wound, I again looked at the ears, and to my astonishment the conditions were again reversed. The left had again become the more vascular and the warmer. Soon there was another change, and at last it became quite apparent that, while the vascular and thermometric condition of the left or operated side was almost, though not quite, stationary, the condition of the right or non-operated ear was one of irregular oscillation; its vessels alternately dilating and contracting in periods, which varied from twenty seconds to three minutes. When its vessels were at their maximum dilatation, their calibre was greater than that of the vessels on the opposite side; when they were at their minimum, their calibre was much smaller. These oscillations of vascularity were accompanied by corresponding oscillations of temperature. The thermometer in this ear was never at rest, whereas, in the opposite ear, the mercury rose gradually to a maximum, and then remained practically stationary.

Doubtless the vascular oscillations[1] of the right ear were nothing more than the normal oscillations of calibre which occur in the arteries of the rabbit's ear independently of the heart's action, and which were first observed by Schiff. The only peculiarity was that in this long-eared rabbit the oscillations were more extensive and less rapid than usual. The section of the sympathetic on the left side had interfered with the normal oscillations on that side, but had not completely stopped them. The residue of normal action was probably due to the fact that the vasal nerves of the rabbit's ear do

[1] I noticed in this case that, when the arteries were widely dilated on the sound side, a smart rap caused them instantly to contract very considerably. When, on the other hand, they were contracted, a similar stimulation caused them to dilate. That is, the stimulation changed the condition of the vessel whatever it might be.

not all pass by the cervical sympathetic, but are in part contained in the great auricular nerve, partly also in a branch derived from the fifth nerve.

Observations very similar to the one just given have been made by Schiff, and a strong argument founded on them in favour of his theory of active vascular dilatation.[1]

It would appear, then, that both in man and animals section of the cervical sympathetic not only interferes with the contraction of the arteries on the side of the section, but also in some way or other prevents their full dilatation; assuming, of course, that the temperature is an indication of the arterial condition, and that it rises and falls with the calibre of the vessels. It would appear that the vessels on the side of the section oscillate in size within very narrow limits, their minimum width being greater and their maximum width narrower than that of the vessels on the sound side.

A certain explanation of this curious phenomenon is yet to be found. Schiff's interpretation is as follows. He holds that in the cervical sympathetic are contained not only nerve-fibres whose office it is to cause arterial contraction, but others also, in smaller numbers, which when stimulated produce vascular dilatation. It is to the section of the former more abundant ones that the ordinary result of hyperæmia is due; and it is to the section of the latter that the inability of the arteries to dilate fully is assigned.

To those who already admit the existence of nerves which *actively* dilate blood-vessels, Schiff's explanation will approve itself. I for one must confess that I see no way of accounting for some of the phenomena described by Schiff, but by admitting the existence of such active dilators. At the same time it is plain that the explanation, so far as I have yet given it, does not cover all the facts. It will account for the copious sweating which immediately follows section of the nerve in the horse; but it will not at the same time explain the utter inability to sweat which occurred at a later period in my patient. So also it will account for the hyperæmia

[1] Cf. Schiff, op. cit., p. 237.

which immediately follows section, but will not explain the marked diminution of that hyperæmia which occurs within a day or two of the section, and before there has been time for any nerve regeneration.

The explanation, however, may be extended so as to include these outlying facts, by taking into consideration certain results of the section of motor nerves.[1] When the motor nerves of a striated muscle are divided, there is at first a slight and transitory increase of extensibility in the muscular tissue. This is, however, soon followed by a change in the opposite direction. There is a loss of extensibility, and this loss goes on increasing until it finally reaches a maximum where it becomes stationary. Later on, the muscle is found not only to have lost extensibility, but actually to have become shortened or contracted. These changes are most strongly marked in the muscles of birds,[2] but they are apparent enough in the case of man. Thus, Messrs. Mitchell, Morehouse, and Keen,[3] in their work on the wounds of nerve-trunks, notice that when a muscle begins to suffer in its nutrition from nerve-lesion, the first effect is the production of a flabby and relaxed condition; but that sooner or later this relaxation gives way, and in many instances is succeeded by a condition of shortening or contraction, which may or may not be associated with a corresponding degree of atrophy. The facial muscles furnish us I think occasionally with an illustration of the same kind. When the facial nerve is cut or injured, a striking deformity is, as we all know, at once produced. The muscles of the uninjured side prevail over their flabby and relaxed opponents, and draw the angle of the mouth and the features generally awry; and this is the case even when the face is at rest. Not rarely the nerve-lesion is a permanent one; but in such cases it will often be found that the distortion does not remain unchanged. In time it begins to decrease, and the face gradually recovers almost entirely its normal aspect, so long as it is at rest. All voluntary power

[1] Cf. Schiff, op. cit., p. 258.

[2] Cf. Vulpian, 'Syst. Nerv.,' p. 265.

[3] Cf. op. cit., p. 72.

over the muscles being permanently gone, this recovery can only be accounted for by supposing that the palsied muscles have gradually contracted, and offer a greater resistance to extension from the sound muscles of the opposite side. This process of contraction may go on to such an extent as to cause the palsied muscles to prevail over the sound ones. I have at present a patient in whom this has occurred. He has long suffered from facial paralysis of the left side. At first the mouth was, as usual, pulled over to the right. Gradually this deformity diminished. The face became straight; and now, the palsy still persisting, the mouth is actually drawn slightly to the left or paralysed side.

Now, we have only to suppose that similar physical changes are produced in the muscular coat of the arteries when *its* motor nerves are divided, and the difficulties which met us before vanish. The gradual diminution of hyperæmia, and the suppression of sweat some time after the section will find an adequate explanation in the altered state of the vessels, which are then no longer capable of sufficient extension. On the other hand, the excessive hyperæmia and the copious sweating which are the earlier consequents of the section, will coincide with the period of augmented extensibility—a condition which will assist the palsy of the circular muscles in producing a wide vascular dilatation.

Let me now apply this explanation to the case of my patient. I imagine that when the nerve-lesion first occurred the hyperæmia of the right side was much more strongly marked than it is at present, and most probably extended at that period to the retina. I imagine also that in those early days there was increased activity of secretion on the side of the nerve-lesion;[1] but that gradually owing to the contraction of the palsied muscular coat the hyperæmia has been reduced to its present insignificant amount; and that in some parts of the face this contraction has so entirely

[1] I could not actually find out when the suppression of sweat began in this man. He said that he had only noticed it *lately*, but could not fix the date for me with any greater precision. It could hardly have existed long without attracting his attention.

balanced the vascular palsy that in them there is no hyperæmia left, though at the same time their inability to sweat shows that they are in some abnormal condition. Heat, exercise, febrile excitement generally, are unable to produce any great increase of vascularity, and so any secretion, on the affected side, partly because of the unyielding nature of the arterial walls, partly because the actively dilating nerve-fibres have been severed. The effect of these stimulants, which act with full force on the vessels of the opposite side, is therefore to invert the conditions of the two sides as regards vascularity, and consequently as regards temperature.

Before I leave this part of my subject, I would point out that, if there really be produced in palsied arteries such a physical alteration as that which I have mentioned, it may perhaps help us to reconcile the discordant results of experiment and of pathological observation as regards the temperature of limbs, the nerves of which have been divided. In experiments such limbs are found—as we should expect *à priori*—to have their heat increased; in pathological cases they have been found to have their heat notably lowered. It may perhaps be that in experiments the temperature has been tested at an early period, in pathological cases at a later period after the nerve-lesion. A physiologist will be almost certain to make his examination within a very short interval after he has cut the nerves; and, on the other hand, a surgeon will be unlikely to make any special observation of the condition of the temperature for some time. Even should he do so, the results will seldom be of use as regards this question, for most probably the injury which has divided the nerve will also have divided the artery, and will thus interfere in another way with the blood supply. Again, there may very possibly be inflammation about the wound, or still more probably the patient may be in a state of febrile excitement, and I have already pointed out that fever or excitement is in itself sufficient to invert the relative conditions of two parts, one of which has its vasal nerves cut, while the other retains them uninjured; and thus we have a second very possible cause of

deception. In corroboration of these remarks, I may quote the following passage from Mr. Hutchinson's instructive paper on the results which follow injuries to nerve-trunks.

"Next to the loss of sensation, respecting which we need say nothing, we have as the chief results of nerve section a diminution of temperature. It is to be noted that none of my cases were accurately observed soon after the accident, most of them not until the wound was healed. Many conditions make trials of temperature at early periods after the injury liable to mislead. Such for instance as the fact that the vessels as well as the nerves are usually cut, that inflammation is in progress at the wound, and that the part is protected by dressings."[1]

Dr. Handfield Jones, in an interesting paper on 'Trophic Nerves,'[2] has suggested another interpretation of the refrigeration after nerve section. He supposes, as I have done, that there is at first dilatation of the arteries and elevated temperature, the vasal nerves being cut as well as the rest; but that the sympathetic fibres, being of simpler structure than the tubular ones, are regenerated long before these latter, so as to resume their control over the vessels; and that when regenerated they are kept in a state of constant irritation by the cicatrix of the skin and subjacent tissues.

To this explanation there appear to me to be several serious objections. In the first place, the refrigeration lasts sometimes without apparent improvement for an indefinite period. Can we admit of an active contraction in the vessels kept up for year after year without any intermission by irritation of the vasal nerves? Is not long-continued active contraction inevitably succeeded sooner or later by the contrary condition of relaxation?

Secondly, what real reason is there to suppose that the vasal nerves are regenerated after section sooner than the tubular nerves? It is true that there is a certain resemblance in general aspect between sympathetic fibres and simple

[1] 'London Hosp. Reports,' iii, 321.

[2] 'St. George's Hosp. Reports,' vol. iii, 94.

fibroid tissue, as[1] Dr. Handfield Jones points out, and that fibroid tissue can be formed with great readiness and rapidity. But surely fibroid tissue and sympathetic fibres, differing as they do in their properties and functions, are not to be looked on as one and the same thing in virtue of this superficial similarity; and the facility of formation of the one is no ground for assuming a similar facility in the formation of the other.

Again, how is it, if these nerve-fibres are so readily regenerated, that when the cervical sympathetic has been cut the alterations in the pupil often remain for an indefinite period without change, though the hyperæmia sooner or later diminishes or even altogether disappears? If the nerve be reformed the two effects of its section should alike and simultaneously disappear on its reformation. As it is, the one effect is permanent, the other temporary.[2]

The objections which I have urged against Dr. H. Jones' explanation of the refrigeration appear to me to have much force. At the same time I would guard myself against being supposed to fancy that the other explanation which I have advanced is free from objections and difficulties, or that it can claim to be more than a mere hypothetical solution of the problem.

Be the true explanation of this matter what it may, it is at any rate clear that the phenomena presented by my patient were practically the same as result in animals from section of the cervical sympathetic. Neither dogs nor rabbits sweat visibly, so that I cannot illustrate from experiments on them the unilateral suppression of sweat which occurred in this

[1] Cf. op. cit., p. 102 and 96.

[2] A similar objection, it is plain, may be made against the other explanation which I have advanced. It may be asked, how is it that, after section of the sympathetic, loss of extensibility, and gradual contraction occur in the palsied muscular coat of the arteries, and yet do not occur in the similarly palsied dilator of the iris? The answer to this would be that the conditions in the two cases are different. The dilator of the iris is kept from undergoing the changes in question by the constant stretching to which its fibres are subjected from the unpalsied sphincter; while there is no such counteracting influence at work in the case of the arterial muscles.

man. Still, that anything which prevents the due dilatation of vessels should also interfere[1] with secretion is only what experience teaches us to expect. It appears to me not impossible that something of the kind occurred in the case of the soldier whose case I gave at the beginning of this paper, at any rate so far as his lachrymal glands were concerned. For in the short account given of his symptoms it is mentioned that "the left eye waters a good deal," though the nerve lesion was on the right.

There is, moreover, a case on record to which I have not hitherto referred, because I have been unable to see the full report of the symptoms, though I entertain no doubt it was one of lesion of the cervical sympathetic. From the remarks made about it in the work of the American surgeons[2] it would seem to have presented phenomena very closely resembling those noticed in my patient. An officer was wounded on the right side of the neck; he suffered from slight ptosis of the right eye, with contraction of the pupil, and imperfect vision. Whether there was hyperæmia in the early period after the injury I do not know. Two years later, however, there was no unilateral flush; "but there was a marked defect in the secretion of sweat on the side of the lesion extending to the neck, arm, and chest, while on the left side, which was not wounded, the secretion was perhaps excessive in amount."[3]

Of the remaining symptoms in my patient, positive or negative, but little need be said. I would, however, point out that, though the hyperæmia had persisted for more than two

[1] I have lately seen an illustration of this. A man had the common carotid tied on the right side of the neck. Two days after the operation I found his left cheek and bone bathed in sweat, the right side quite dry.

[2] Cf. op. cit., p. 44 and 86.

[3] Cf. op. cit., p. 86. If the arm was really affected as well as the neck, it would seem that there must have been some other lesion than one of the cervical sympathetic. The right arm in my patient sweated. It is true that in the man's opinion it did not sweat quite so freely as did the left; but this slight difference can be explained by the difference of vascularity in the two arms; for it will be remembered that the circulation in the right arm was carried on under difficulties.

years, no inflammatory process had been set up. This is in accordance with the results of experimentation. Inflammation after section of vaso-motor nerves only occurs when either the animal is in an enfeebled state or when the hyperæmic parts are subjected to undue irritation.

Less consistent with experiment was the utter absence of hypertrophy. Neither in facial bones nor in facial muscles could I detect any increase of bulk; though in Schiff's experiments the former, and in Benedikt's the latter were noticed to become hypertrophied. It must, however, be remembered, that the man had already reached middle age; and that it is chiefly, if not solely, in young and growing organisms that hypertrophy follows on nerve-section.

I would also call attention to the fact that the pulse was always rapid, never below 90 in the minute. It is quite possible that this rapidity was not directly connected with the nerve lesion in the neck. Still the experiments of v. Bezold[1] show that, though section of the cervical sympathetic usually retards the heart's action, this result is not a constant one, but that in a certain minority of cases the contrary effect is produced and the action accelerated.

In conclusion, I would say that I cannot but believe that cases similar to the one I have described will be found to be not very uncommon. Contraction of the pupil coincident with cervical tumour is of very frequent occurrence. The usual explanation of these cases is, that the tumour presses on the sympathetic, and by its pressure paralyses the action of those nerve filaments which govern the dilator muscle of the iris. In order to explain the absence of hyperæmia it is assumed that the vaso-motor filaments lie in the central part of the sympathetic nerve, while those of the iris lie on its surface, and that thus the pressure is able to act on these latter, while the more deeply seated filaments escape.[2] When we

[1] Cf. Funke's 'Phys.,' ii, 674, 4th edition.

[2] "Es scheint dass die oculopupillären Nervenrohren im Faserstrang des Halssympathicus am meisten peripherisch gelagert sein müssen, da bei der Compression durch Tumoren die Functionsstörungen im Gebiete jener Fasergruppe weit constanter und mit grösserer Intensität auftreten als in der vasomo-

consider what is the size and nature of the cervical sympathetic, and also how frequently the phenomenon in question occurs, it is difficult to admit this explanation. We might, indeed, conceive of slight pressure which should be sufficient to *stimulate* the superficial filaments without affecting the deeper ones; but how the pressure can be sufficient practically to destroy the superficial fibres, and this permanently, and yet in no way affect the rest, it is hard to imagine. That such an occurrence should be a common one it is impossible to admit.

I think that it will be found that in some of these cases the vaso-motor filaments *are* affected, and that the hyperæmia has been diminished by lapse of time, until it has either altogether vanished, or until, as in my patient, it has become so slight as very easily to escape notice; while in many others it will be found that the sympathetic nerve is altogether unaffected, and that the contraction of the pupil is due to pressure exercised on the jugular veins.[1] For that such compression may produce contraction is abundantly plain from the interesting experiments of Kussmaul on the influence of the circulation upon the size of the pupil.

torischen und trophischen Faserbündeln des Kopftheils."—Eulenberg und Guttmann, 'Archiv fur Psychiatrie,' i, 422.

[1] Cf. Kussmaul, 'Einfluss der Blutströmung auf die Iris,' &c., 1855, p. 28.

ON THE

OPERATIONS FOR THE RELIEF

OF

CHRONIC INVERSION OF THE UTERUS;

WITH

THE HISTORY OF A CASE SUCCESSFULLY TREATED BY A NEW METHOD.

BY

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Received Feb. 5th.—Read April 13th, 1869.

Three most valuable memoirs on chronic inversion of the uterus are contained in the 'Medico-Chirurgical Transactions.' The first by Mr. Windsor (vol. x) embodies a case in which the uterus was removed successfully by the ligature gradually tightened. The second is by Mr. Gregory Forbes (vol. xxxv). This embraces the result of much valuable research, a judicious appreciation of the value of the ligature and excision, and the detailed record of a case which ended in death without being subjected to any surgical operation. The third memoir is by Dr. Tyler Smith (vol. xli). This

contains "a case of complete inversion of the uterus nearly of twelve years' duration, successfully treated."

The treatment was based on a new principle—that of sustained elastic pressure—and gave hope that this terrible accident, for the relief of which hitherto, the only choice lay between different modes of extirpating the uterus, might be remedied by restoring the uterus to its normal condition. Subsequent experience has, to a great extent, justified this hope. Still, the method of restoring the uterus by the simple action of sustained elastic pressure, may sometimes fail; and a return to the repulsive proceeding of extirpation may still be necessary, unless pressure be assisted by other means.

In the memoir which I have now the honour to submit, I shall relate a case which illustrates a means of restoring the uterus even in those cases which will not yield to simple sustained pressure. I think it will appear that this means is so effectual that we may now fairly hope to abolish the operation of extirpation altogether.

As cases of reduction of the inverted uterus after the lapse of several days are still rare, I beg leave to use this opportunity of putting on record a case in which I successfully restored the uterus after it had been inverted nine days, and had baffled many attempts by others.

I do not propose to touch the history of recent inversion, but simply to discuss the merits of the different modes of dealing with chronic inversion. With this object in view, I shall endeavour to extend the information contained in Mr. Forbes's memoir by adding, in a condensed form, cases of inversion treated by operation, which have either been published since he wrote, or had escaped his research.

It will be useful before proceeding, to define the terms "recent" and "chronic" inversion. I would submit that "recent" inversion terminates with the completion of the process of involution of the uterus, and the return of the organ to the ordinary condition of non-impregnation. This condition is commonly attained in about a month. Until it is attained the uterus exceeds the normal bulk; and probably the cervix remains more distensible. Within this period, reduction by

taxis simple will often succeed; although where there is much resistance it would generally be better to use sustained elastic pressure.

The following case comes within the definition of "recent inversion."

CASE.—*Inversion reduced on the tenth day.*—Mrs. A—, pluripara, was delivered on the 13th December, 1866, by a midwife, who is reported to have pulled at the placenta, which came away much torn; the patient was also told to cough; she does not remember having strained much.

The uterus became quite inverted; deep collapse followed, in which state she was seen by a surgeon. Considerable prostration with some oozing, but no marked flooding continued for nine days. When I was called in many attempts had been made to reduce the uterus. I found her blanched; pulse 120; weak; complaining of pain in the pelvis. The uterus had been quite external; and its surface was thought to be gangrenous. When I saw her, the uterus was in the vagina; it was a solid but flaccid mass rounded, prolonged by a stalk, and closely resembling a polypus; the size was that of a small cocoa-nut, just as much as the hand could grasp. The diagnosis from polypus was clearly made out by tracing the pedicle, when a circular groove was felt all round the spot whence it sprang, giving no passage to finger or sound beyond; and by the absence of uterine tumour above the pubes, ascertained by the fingers of the right hand pressed into the pelvis above, encountering the examining fingers in the roof of the vagina, and feeling the uterus below in the pelvic cavity. The funnel formed by the inverted os uteri was also plainly felt through the abdominal wall.

The patient was placed under chloroform and laid on her left side, inclining forwards on the abdomen. Then, by left hand in the vagina, compression was exerted on the pedicle near the constricted os, so that one or two fingers passed within the os; then, continuing this grasp, and pushing the mass of the tumour upwards and towards one side of the brim of the pelvis by the palm, in about ten minutes I felt

the cervix begin to yield, and presently the mass went through, my hand following into the cavity of the uterus, which was restored. I applied a sponge saturated with perchloride of iron to the inner surface of the uterus to correct fœtor and to promote contraction of the uterine fibre. This it did almost immediately; for the uterus previously flaccid, became firmer. When restored, the uterus was easily felt, as a firm globe through the abdominal wall rising above the pubes.

Some time afterwards as the patient remained weak, and was badly nursed and nourished, I took her into St. Thomas's, where she made a good recovery. The uterus returned to its normal size; but she afterwards complained of dysmenorrhœa.

Table I.

Chronic inversion of the uterus treated by ligature.

A.—*Successful.*

No.	Age.	No. of Pregnancy.	Author and reference.	Summary of history.
1	22	Second labour.	C. G. Putman, Amer. Jour. Med. Sci., 1856.	Inversion of three months; ligature tightened by a screw; uterus came away on eleventh day.
2	23	Second labour.	Ibid.	Inversion of one year; ligature; uterus came away at end of two weeks.
3	22	Second labour.	W. Channing. Boston Med. Jour., 1859.	Inversion of eighteen months; taxis failed; ligature; uterus came away on the twentieth day.
4	24	—	Ibid.	Inversion of one year; ligature; uterus "came away in due time."
5	22	—	Ibid.	Inversion of one year; ligature; ligature and uterus came away on thirtieth day.

B.—*Unsuccessful.*

No.	Age.	No. of Pregnancy.	Author and reference.	Summary of history.
1	46	—	Symonds, Med.-Chir. Rev., vol. xiv.	Inversion for nine months; uterus ligated and tightened every other day; uterus came away on fifteenth day; death on sixteenth day of peritonitis.
2	25	First labour; twins.	C. G. Putman, Amer. Jour. Med. Sci., 1856.	Inversion of eight months; ligature tightened as patient could bear it; tumour detached; death from exhaustion on ninth day.
3	35	—	W. Channing, Boston Med. and Surg. Jour., 1859.	Inversion of one year; ligature tightened daily; on the tenth day being moved, she fainted and died; uterus almost separated.
4	—	—	W. Hunter, MSS. cited by Gooch.	Ligature applied; death.
5	—	—	Marion Sims (same case related under "Excision").	Ligature tightened, had to be removed in two hours, the "Constitutional disturbance being so intense and alarming."

Table II.

Chronic inversion of the uterus treated by ligature and excision.

A.—*Successful.*

No.	Age.	Author and reference.	Summary of history.
1	66	McClintock, Diseases of Women, 1863.	Inversion caused by a polypus; polypus first removed by écraseur; then the uterus removed by chain, a ligature having been on previously, and tightened for three days.
2	Coloured woman unmarried	E. Geddings, Amer. Jour. Med. Sci., 1854.	Inversion of twenty years; a strong ligature applied to the neck, when it was cut through below ligature by a bistouri.
3	—	Mr. Dale, of Scarborough, Lancet, 1862.	Inversion of nine (?) months; a tumour attached to the fundus; tumour first removed; then the uterus by Gooch's ligature; uterus came away on eleventh day; lived three months.
4	22	McClintock, loc. sup. cit.	Inversion of fourteen months; excision below a ligature, which had been on forty-eight hours, by chain-écraseur.

Table III.

Chronic inversion treated by excision.

A.—*Successful.*

No.	Age.	Author and reference.	Summary of history.
1	—	Luytgaerens, Edinb. Med. and Surg. Jour., 1840.	Inversion caused by a large polypus; extirpated by strong curved scissors.
2	39	Marion Sims, Notes on Uterine Surgery, 1866 (same case as No. 5, B, unsuccessful, Table I).	Inversion of more than six months; by chain-écraseur; opening made into peritoneal cavity; "frightful hæmorrhage;" it was closed by silver sutures.
3	42	A. Baker, Brit. Med. Jour., 1868.	Inversion (not complete) of nine months' duration; uterus drawn down and removed by écraseur.

B.—*Unsuccessful.*

1	—	Scanzoni, Beiträge, 1868.	Chronic inversion caused by a polypus; uterus removed by écraseur; peritonitis; died. There was an opening into the peritoneum.

Table IV.

Inversion treated by sustained solid pressure.

A.—*Successful.*

1	—	Borggreve, Brit. and For. Med.-Chir. Rev., 1842.	Inversion of three days ("recent"); a stem with an egg-shaped knob kept pressing on the fundus three days; reversion effected.
2	—	Marion Sims, Notes on Uterine Surgery, 1866.	A stem-pessary, with an external support, for "some days;" the uterus was reinverted, and the pessary was taken up into the uterine cavity.

Table V.

Chronic inversion treated by sustained elastic pressure.

A.—*Successful.*

No.	Age.	Author and reference.	Summary of history.
1	—	Tyler Smith, Med.-Chir. Trans., 1858.	Inversion of twelve years; Gariel's air-pessary used for more than a week; complete reversion took place.
2	25	Charles West, Med. Times and Gaz., 1859.	Inversion of nearly twelve months; air-pessary used for "a few days;" reversion effected.
3	25	Bockenthal, Monats. für Geburtskunde, 1860.	Inversion of six years; Braun's caoutchouc bag for six days; reversion effected.
4	—	Pridgen Teale, Med. Times and Gaz., 1859.	Inversion of six months; air-pessary for three days; reversion effected.
5	—	Birnbaum, Monats. f. Geburtsk., 1862.	Inversion of three months; air-pessary and bulbed sound for some days; reversion effected.
6	—	James Hakes, Liverpool Med. and Surg. Jour., 1868.	Inversion of nine (?) months; air-pessary for fourteen days; reversion effected.

B.—*Unsuccessful.*

1	—	Robert Barnes. (This memoir.)	Inversion of six months; water-pessary for four or five days; at length cured as related.

The case of Mr. Hakes I have thought desirable to quote in greater detail. It is very instructive, as demonstrating the value of a steady perseverance in sustaining elastic pressure for a considerable time.

A primipara, æt. 23, was delivered naturally on the 4th March, 1867; a moderate flow of blood followed the expulsion of the placenta. An attack of secondary hæmorrhage set in about a month afterwards. "The doctor who came

to see her, introduced his hand and arm into the vagina, and brought away an immense quantity of clotted blood." From that time a sanguineous discharge persisted. She was admitted into the Liverpool Hospital, when a tumour was found in the vagina; the os uteri formed a ring round the neck of the tumour, so that the finger passed through this contraction at every part, into a cul-de-sac about half an inch deep. Taxis under chloroform made no impression. Continuous pressure was then applied by an air-pessary in the vagina for about a fortnight, at the end of which time the tumour was found to be gone; the vagina was very much distended, and the os uteri was large and puffy. There was great anæmia. She made a good recovery.

It does not clearly appear when the inversion took place, but it was probably immediately after labour. I believe the reduction in this case was effected after a longer subjection to elastic pressure than in any other recorded case.

That even after fourteen days, success has followed elastic pressure, is a strong ground for increased confidence in this method.

Of late years attempts have been made to raise the once-exploded method of restoring the inverted uterus by forcible taxis to the rank of a scientific operation, and even to show that it ought to be preferred to other proceedings. It will, therefore, be useful to pass under review the histories of those cases in which it has been applied.

Cases treated by Forcible Taxis.

1. A chronic case of fifteen years' standing was replaced by Professor White, of Buffalo, in fifty minutes. The patient died of peritonitis sixteen days afterwards.

2. Dr. Noeggerath, of New York, reduced an inversion of thirteen years' standing. Recovery.

3. Dr. Marion Sims relates the following case:—A woman, æt. 39, had inversion of six months' duration. Forcible taxis was tried during four hours without success. It was

feared that the vagina had been stretched to the verge of being ruptured. After eighteen days, another effort, lasting one hour, was made to replace the uterus, without success. A ligature was passed round the cervix and tightened. The constitutional disturbance was so intense and alarming, that he was compelled to remove the ligature in two hours.

Ten months after the occurrence of the inversion, the uterus was removed by the chain-écraseur. The "most fearful hæmorrhage" took place; this came from a part of the broad ligament still adherent to the severed uterus. Dr. Sims stopped it by compressing the remains of the ligament against the edge of the cervical opening. The blood was then sponged out of the vagina, and the undivided portion of the broad ligament was tied; after which a few sponge probangs were passed into the peritoneal cavity, and the blood that had found its way there, was carefully removed. The divided edges of the cervix were united by five or six silver sutures. The edges united by first intention. The patient recovered.

4. Dr. M. Sims relates another case. It was of twelve months' duration. He replaced it in five minutes under ether. The patient recovered.

5. Dr. McClintock, in a case of fourteen months' standing, made three persevering attempts on White's plan, without success. He had to desist in consequence of the "supervention of a state of prostration bordering on collapse." The uterus was ultimately removed by ligature and écraseur.

6. Dr. Noeggerath ('Amer. Med. Times,' 1862).—V. R., æt. 38, had inversion of thirteen years. Dr. Noeggerath reduced it by the hand; he made pressure in such a manner, that one corner of the uterus only was pressed upon. The patient did well.

7. Dr. Praël ('Monatsschr. f. Geburtsk,' 1865).—A woman, æt. 20, inversion of several months' standing. Attempts were repeatedly made to reduce it by an egg-shaped instrument, but had to be abandoned on account of gastric disturbance. Peritonitis and death followed.

8. Dr. George Mendenhall ('Cincinnati Lancet,' 1859).

—Æt. 24; second labour, seen on the sixteenth day; the uterus occupied the entire vagina, it was reduced under anæsthesia by hand, and a rectum-bougie applied to the fundus of the uterus. Successful. (This case, the uterus not having undergone complete involution, ought perhaps to be subtracted, as not being one of chronic inversion.)

8*a*. Professor White ('Amer. Journ. of Med. Sc.,' 1858). —Æt. 32; second labour; uterus reduced in about fifty minutes under anæsthesia. Died of peritonitis; no laceration or injury found.

9. Professor White ('Amer. Journ. of Med. Sc., 1858).—Æt. 19; first labour; profuse hæmorrhage. Dr. White reduced it on the eighth day by hand and rectum-bougie on the fundus of the uterus. She died two days afterwards; the uterus showed no injury; death ascribed to anæmia. Probably shock had a share in fatal result. It ought to be regarded as a case of "recent inversion."

9*a*. Dr. Fisher, of Chicago ('Chicago Med. Journ. 1858), quoted by Dr. C. A. Lee, relates a case of inversion of four months; replaced by hand. Woman recovered.

Adding the cases cited and tabulated by myself to those of Mr. Forbes, we get the following summary :—

I. Cases treated by ligature.	A. Successful	26
	B. Unsuccessful	10
		36

Of the unsuccessful, 8 died; 2 recovered without extirpation.

II. Ligature and excision.	A. Successful	9
	B. Unsuccessful	3
		12

The three unsuccessful cases died.

III. Excision simple.	A. Successful	4
	B. Unsuccessful	2
		6

The 2 unsuccessful cases died.

IV. Sustained solid pressure.	A. Successful	2
V. Sustained elastic pressure.	A. Successful	6
	B. Unsuccessful	1
		7
VI. Forcible taxis.	A. Successful	4
	B. Unsuccessful	5
		9

Of the unsuccessful cases, 3 died.

It would be idle to deal with these cases in statistical fashion. But a clinical comparison will lead to sufficiently definite indications for practice.

As to *ligature simple.*—Although ligature shows a large number of successes, these are balanced by lamentable failures. A large proportion of cases ended fatally; and in two the ligature had to be taken off on account of the intolerable pain. That is, the method had to be abandoned. The ligature applied after the plan of Levret and Gooch, that is, by gradually tightening it round the neck, and so causing the uterus to drop off by mortification, is presumed to be better than the immediate abscission by the chain or wire-écraseur, by favouring adhesive inflammation of the peritoneum above the ligature, and thus sealing up the abdominal cavity. But this result has not always been attained. And where inflammation has followed, it has not seldom exceeded the wished-for limits.

Dr. Ramsbotham relates a case of ten months standing, in which the ligature had been removed in twenty-four hours on account of the pain. Health was restored, although the uterus was not removed. Mr. Forbes reasoning partly, I believe, upon this case, has suggested that "the simple application of a ligature round the neck of the tumour, in order to destroy its vitality, appears to possess more advantages than the other modes of operating." But to stop short at such mere palliation, is but a sorry achievement for modern surgery.

As to *ligature and excision.*—This combined plan seems to offer more prospect of success than the ligature simple. Still it is vitiated by uncertainty. The ligature alone has caused death from the shock of intense pain, although it has been removed quickly. And when ablation has been accelerated by excision below a ligature a fatal issue has resulted.

As to *excision simple.*—The successful cases have been very few; and the perusal of the histories justifies the conviction that success, although partly the result of skill, was in great measure due to good fortune, or to extraordinary power of endurance on the part of the patient.

It is a fault that attaches to all the three foregoing methods that the highest success attainable involves the loss of the uterus. The woman is mutilated, unsexed; whilst if they fail: in the case of ligature, life is probably sacrificed, and in the case of excision, death is the certain penalty.

The methods of reducing the uterus to its normal position have this very great advantage, that success restores the woman in all her integrity. Many cases are now known in which women who have been the subjects of inversion have afterwards borne children happily. But the various methods of reduction are not all of equal merit. In cases of quite recent inversion direct taxis will generally be the method. In cases where the inversion has lasted three days or more, but which are still "recent," it will be proper to attempt, in the first instance, direct reduction by taxis, steadily but prudently avoiding excessive force; and if the resistance is not so overcome, then to apply sustained elastic pressure, occasionally trying the taxis. It is not improbable that the case (No. 9) in which Professor White reduced an inverted uterus of eight days' standing by taxis, and which ended fatally, might have been saved had elastic pressure been trusted to. But in chronic cases the taxis too often means violence, which it is easy to carry beyond the limit of endurance. Thus out of nine cases recorded here three ended fatally. In two others the method was abandoned as impracticable. And in many more cases in which ligature or excision was ultimately adopted the taxis had previously

failed. Nor can we look with unalloyed satisfaction upon such successes as those related by Professor White and Dr. Noeggerath; we cannot help feeling that the patients had a narrow escape from fatal injury. Hitherto the forcible taxis can hardly boast more success than extirpation.

The method of *keeping up pressure* upon the constricted cervix *by a solid body* is based upon a sound and safe principle. There can be little doubt that if pressure could be sustained acting directly upon the cervix for a sufficient length of time that its resistance would be worn out, either by direct stretching of its tissues or by the gradual structural change. The choice of the particular means for sustaining pressure must be determined by circumstances. Evidence seems to be in favour of elastic pressure.

Dr. Tyler Smith's example has been imitated in five other cases, thus amply proving the safety and efficacy of the new method. It has one advantage, also possessed, indeed, by the ligature; during the application of the air-pessary, the hæmorrhage is restrained, so that the patient can generally afford to wait and to give the method time. But it has advantages over and above the preservation of the uterus, which the ligature has not. The pain can be made very endurable. It can rarely be necessary to abandon the pressure on account of suffering or injury.

The time during which it may be reasonable to keep up pressure is not easy to define. In Mr. Hake's case success rewarded a fortnight's perseverance. I am willing to believe that, in my own case, had I persevered for a longer time the uterus might have been reduced.

Certainly, I think, there is now evidence enough to warrant the dictum, that ablation of the uterus is not justified until after reduction by elastic pressure has been steadily tried.

And when elastic pressure has failed there is still another resource that stands before amputation: this is the method adopted by myself in the case I will now narrate.

Sarah C—, æt. 29, was admitted at St. Thomas's in November, 1868. She has had two children, the last in May, 1868. She had flooding at the time, and the placenta had

to be detached from a tumour which was taken to be a polypus. This tumour was believed to be returned into the uterine cavity; and hence a confirmation of the opinion that it was really a polypus was drawn. I am inclined to think that it was the inverted uterus which was re-inverted or restored, and that the uterus became again inverted. Hæmorrhage returned at the end of a month, and continued more or less, so as to induce extreme anæmia and emaciation. It was obvious that she could not hold out much longer against the increasing exhaustion. A tumour the size of a hen's egg was felt in the vagina, connected by a neck narrower than the body of the tumour to the os uteri; at one point the sound seemed to penetrate half an inch beyond the edge of the os. The tumour was not sensitive, it was taken to be a polypus, and it was determined to remove it by the wire-écraseur. The wire was applied on the 12th November. At the first gradual tightening, the patient complained of acute pain. It immediately occurred to me that I had made an error in diagnosis, and that the wire had encircled the uterus. I removed the wire, and having passed a sound into the bladder and finger into the rectum I turned the point of the sound backwards, when I readily felt it by the finger in the rectum just above the root of the tumour. I subsequently felt the point of the sound by a finger in the vagina carried up behind the root of the tumour, thus clearly determining that the uterus was absent from its normal place. The patient was sent back to bed; an opiate was administered, and further proceedings adjourned. No bad symptoms followed. On the 14th November I resorted to elastic pressure. A caoutchouc bag was placed in the vagina and kept distended with water. This was kept up during five days. Twice during the interval I tried to reduce, by taxis, under chloroform. At one time I thought I had made some impression upon the constricted os, but fatigue compelled me to desist. The taxis was performed by passing the left hand within the vagina, grasping the circumference of the tumour and trying to squeeze the root of it through the ring of the os, whilst the tips of the fingers of the right hand

pressed down through the abdominal wall, dipped into the funnel formed by the inverted uterus and gave a counter-pressure and support to the hand inside.

This failing, and the patient being too much prostrated to justify further delay, I determined upon making one more effort to reduce the uterus by the aid of a plan which I have advocated in my lectures for the last twenty years, and which has been suggested by Huguier, Simpson, Sims, and others. This consists in incising the os uteri at two or three points of its circumference, so as to relax the constriction formed by the circular fibres of the cervix, before applying the taxis.

This I accordingly did on the 23rd November. I drew down the uterus outside the vulva by means of a sling of tape passed round its body, preferring this to seizing it by hooks or vulsella. The neck being on the stretch, I made three longitudinal incisions into it, one on each side and one behind. The incisions were about a third of an inch deep and two thirds of an inch long. I then passed the uterus back into the vagina, followed it with my hand, and proceeded to re-invert. I was surprised to find how readily the uterus went through the os, but I was not a little uneasy at feeling that the uterine tissue gave way, as if the excisions were extended by laceration. No bad symptom, however, followed, and there was but little hæmorrhage. She had an opium suppository and opium by the mouth from time to time, and perfect rest was enjoined.

On the 1st December, that is eighteen days after the operation, she had three attacks of rigors with pain in the abdomen and tenderness on pressure; no vomiting.

On the 5th there was some heat of skin; the temperature was 100; pulse 110.

On the next day the pulse dropped to 100.

On the 11th the temperature was 99·5°, and the pulse remained at 100. The abdominal tenderness subsided.

On the 23rd I made the first examination; the uterus was *in situ;* the os was a transverse fissure; all seemed to be in healthy condition. Some days later I introduced the sound. By this it was ascertained that the cavity of the uterus was

somewhat shorter than normal. This I had observed by the finger at the time of reducing it. It was, I believe, the result of the long standing inversion.

This, I believe, is the first and only case in which the operation described has been performed.

Reflecting upon my own experience and that of others, I should now be disposed to modify the plan pursued in the case narrated above. Failing with simple elastic pressure, I should make a shallow incision on either side of the os uteri, omitting the third incision behind; then, instead of resorting immediately to taxis, I should re-apply the elastic pressure. The gradual gentle action thus obtained would be safer from the risk of laceration.

I would also insist upon the expediency of swabbing the interior of the uterus after restoration, with a solution of perchloride of iron. In recent cases especially, this application will be useful in preventing hæmorrhage, in promoting contraction, and in obviating the re-occurrence of the inversion.

In conclusion I wish to submit two or three propositions bearing upon the important point of the diagnosis of inversion of the uterus from polypus. The means of distinguishing the two affections are entirely satisfactory; but inversion is so rare, and therefore so little looked for, that these means are apt to be neglected. Dubois and others relate cases in which surgeons of the greatest celebrity would have been saved from the fatal error of tying an inverted uterus for polypus, had they explored by the finger in the rectum and the sound in the bladder.

Many observers bear testimony to the fact that the sensitiveness of the inverted uterus is not to be trusted to as a diagnostic sign. In many cases no pain is complained of when the body of the uterus is handled. But the case is very different when compression is applied to the neck of the tumour. The round ligament, the Fallopian tubes, perhaps the ovaries, are compressed, and agony inducing prostration is the immediate result. This is truly diagnostic; and it may perhaps be turned to account without the dangerous test

of the ligature by squeezing the neck between the finger and thumb.

Even where the diagnosis of polypus is made clear beyond doubt, it is possible that the ligature may seize a portion of the uterus beyond the stalk of the tumour. Gooch especially warns against this risk, and relates cases in point. Desault, Denman, and others give similar examples.

2. Before ligaturing a presumed polypus, if the sound cannot be passed two inches or more beyond the os uteri, where it embraces the stalk of the tumour, the sound should be passed into the bladder, and its point felt for by a finger in the rectum above the tumour.

3. Never induce anæsthesia for the removal of a polypus. If the ligature be tightened round a polypus it gives no pain; if it be tightened round the uterus the pain produced gives warning and the opportunity of retrieving error.

A THIRD SERIES

OF

ONE HUNDRED CASES OF OVARIOTOMY,

WITH

REMARKS ON TAPPING OVARIAN CYSTS.

BY

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Received March 9th, 1869.—Read April 27th, 1869.

THE "History and Progress of Ovariotomy in Great Britain," the "Selection of Cases for the Operation," and the "Situation and length of the incision" required, were brought before this Society in three papers, which have been published in the 46th, 48th, and 50th volumes of the 'Transactions.' These papers contain tables of 200 cases in which I have completed the operation, arranged in the order of performance in four series of fifty. All the cases where I had commenced the operation but had not completed it, or had made an exploratory incision, were also arranged in separate tables.

Following up the same plan, I now bring before the Society a third series of 100 cases in which ovariotomy was completed, seven cases where it was commenced but not completed, and seven cases where an exploratory incision was made. The tables are in the same form as before. But as all the hospital cases have been published and none of the cases in private practice, I have distinguished the private cases by adding the name of the patient's ordinary medical attendant, or of some gentleman who has seen her with me in consultation.

Table of Cases.

The Tables are arranged in Three Series:—

Series I.—Cases in which Ovariotomy was completed—100 cases: 77 recoveries, 23 deaths.
„ II.—Cases in which Ovariotomy was commenced, but not completed—7 cases: 4 relieved or cured, 3 died.
„ III.—Cases where an Exploratory Incision was made—7 cases: 5 relieved or cured, 2 died.

Series I.—Cases in which Ovariotomy was completed.

No.	Medical attendant.	Date.	Age.	Condition.	Adhesions.	Treatment of pedicle.	Weight of fluid or tumour.	Length of incision.	Results.
		1867.					Pounds.	Inches.	
201	Mr. Illingworth	March	40	Single	None	Cautery	14	5	Recovered.
202	Mr. Wakefield	March	27	Single	None	Cautery and ligature	16	5	Recovered.
203	Hospital	March	47	Married	Parietal	Clamp	25	5	Recovered.
204	Dr. Hingston, Plymouth	March	43	Single	None	Cautery	14	6	Recovered.
205	Hospital	March	35	Single	Extensive	Ligature returned	23	6	Died, 20th day.
206	Mr. Shipman, Grantham	April	43	Married	Parietal	Clamp	32	5	Recovered.
207	Dr. Graily Hewitt	April	43	Married	Parietal	Clamp	14	6	Recovered.
208	Hospital	May	31	Single	Parietal	Clamp	37	5	Recovered.
209	Hospital	May	29	Married	Parietal	Clamp	38	5	Recovered.
210	Mr. Marsack, Tunbridge Wells	May	40	Married	None	Clamp	18	5	Recovered.
211	Hospital	May	53	Married	None	Clamp	14	5	Recovered.
212	Mr. C. Reade, Clifton	May	37	Single	Ruptured adherent cyst	Clamp	42	5	Recovered.
213	Hospital	June	33	Widow	None	Clamp	52	4	Recovered.
214	Mr. Tapson	June	57	Single	Parietal, omental, and intestinal	Clamp	15	5	Died, 42 hours.
215	Hospital	June	52	Married	Parietal	Clamp	17	4	Recovered.
216	Dr. Burrows	June	35	Married	None	Clamp	16	5	Recovered.

217	Dr. Southey	June	39	Single	Parietal	Clamp	26	5	Recovered.
218	M. Nélaton	June	42	Married	Omental	Clamp	28	8	Recovered.
219	Dr. Barnes	June	38	Single	Parietal & intestinal.	Clamp	19	5	Recovered.
220	Hospital	July	50	Single	Parietal	Clamp	27	5	Recovered.
221	Hospital	July	56	Married	None	Clamp	5	4	Recovered.
222	Dr. Priestley	July	59	Widow	None	Clamp	40	6	Recovered.
223	Hospital	July	51	Married	None	Clamp	13	4	Died, 8th day.
224	Hospital	July	53	Married	Parietal and omental	Clamp	41	6	Died, 8th day.
225	Hospital	Aug.	25	Married	Pelvic	Cautery	12	4	Recovered.
226	Dr. Symonds, Clifton	Aug.	41	Widow	None	Cautery	11	4	Recovered.
227	Dr. Grasemann	Aug.	25	Single	None	Cautery	13	4	Recovered.
228	Mr. Franks, Sevenoaks	Aug.	27	Single	Parietal	Cautery	16	5	Recovered.
229	Mr. Woolmer	Oct.	27	Married	Parietal	Cautery and ligatures	40	5	Died, 51 hours.
230	Dr. Bowles, Folkestone	Oct.	52	Married	None	Cautery and ligatures	18	4	Recovered.
231	Dr. Budd, Clifton	Oct.	56	Single	Parietal	Cautery	6	4	Recovered.
232	Hospital	Oct.	40	Married	Omental	Clamp	32	5	Recovered.
233	Dr. West	Oct.	40	Single	None	Cautery and ligatures	18	4	Recovered.
234	Hospital	Nov.	42	Single	Parietal	Clamp	30	5	Recovered.
235	Hospital	Nov.	46	Married	Parietal and omental	Clamp	15	5	Recovered.
236	Dr. Whitehead, Manchester	Nov.	51	Married	Omental	Ligature	9	7	Died, 13th day.
237	Mr. Kesteven	Nov.	34	Married	Parietal	Clamp	20	5	Recovered.
238	Hospital	Nov.	28	Single	Parietal and omental	Clamp	19	5	Recovered.
239	Hospital	Nov.	30	Married	Parietal	Clamp	10	5	Recovered.
240	Hospital	Dec.	25	Single	None	Clamp	10	4	Recovered.
241	Hospital	Dec.	51	Married	Intestinal	Cautery	11	5	Recovered.
242	Mr. E. P. Young	Dec.	40	Single	Parietal and omental	Clamp	16	5	Recovered.
243	Dr. De Mussy	Dec.	41	Single	Parietal	Clamp	24	5	Recovered.
244	Hospital	Dec.	23	Single	Parietal and omental	Clamp	21	7	Recovered.
		1868.							
245	Hospital	Jan.	22	Single	None	Clamp	26	4	Recovered.
246	Hospital	Jan.	48	Married	None	Cautery and ligatures	14	4	Died, 5th day.
247	Dr. Cleveland	Jan.	25	Single	Parietal	Cautery and ligatures	11	5	Recovered.
248	Hospital	Jan.	34	Single	None	Clamp	25	5	Recovered.

No.	Medical attendant.	Date.	Age.	Condition.	Adhesions.	Treatment of pedicle.	Weight of fluid or tumour.	Length of incision.	Results.
							Pounds.	Inches.	
249	Hospital	Jan.	32	Married	Parietal and omental	Clamp	46	7	Recovered.
250	Hospital	Feb.	33	Single	Intestinal	Ligature	11	5	Died, 4th day.
251	Hospital	Feb.	30	Single	Parietal	Clamp	16	5	Recovered.
252	Mr. Smith, Battle	Feb.	50	Married	Parietal	Clamp	21	5	Recovered.
253	Hospital	March	33	Single	None	Clamp	19	6	Recovered.
254	Dr. Buckall, Chichester	March	34	Married	Parietal and omental	Clamp	20	5	Recovered.
255	Mr. Morris, Edmonton	March	54	Married	None	Clamp	19	5	Recovered.
256	Hospital	March	38	Widow	Omental	Clamp	28	5	Recovered.
257	Hospital	March	28	Single	Omental	Clamp	19	5	Recovered.
258	Mr. Nunn	March	34	Married	Parietal, omental, and intestinal	Ligature	50	6	Died, 48 hours.
259	Mr. Crompton, Birmingham	March	62	Married	None	Clamp	20	3	Recovered.
260	Dr. Tilt	March	50	Single	Parietal	Clamp	7	4	Recovered.
261	Hospital	April	39	Widow	Parietal	Clamp	18	4	Recovered.
262	Hospital	April	20	Single	Parietal and omental	Clamp	32	4	Recovered.
263	Hospital	April	42	Married	Parietal	Clamp	21	4	Recovered.
264	Dr. E. Ellis	April	54	Single	Parietal and omental	Pins and ligatures—both ovaries removed	30	5	Died, 80 hours.
265	Hospital	May	50	Widow	Parietal	Clamp and ligatures—both ovaries removed	32	5	Recovered.
266	Hospital	May	39	Widow	None. — Ruptured cyst	Clamp	25	5	Recovered.
267	Mr. Mason, Surbiton	May	43	Married	Parietal, intestinal, and pelvic	Ligatures	24	6	Died, 2 hours.
268	Dr. Pocock, Brixton	May	24	Married	Parietal and omental	Clamp	26	5	Recovered.
269	Hospital	May	32	Single	None	Clamp	17	5	Recovered.
270	Hospital	June	23	Single	None	Clamp	20	4	Recovered.
271	Hospital	June	42	Married	None	Clamp	13	4	Recovered.

272	Dr. Redlich, Moscow	June	57	Widow	Parietal	Clamp	31	5	Recovered.
273	Hospital	June	49	Single	Parietal	Clamp	50	4	Recovered.
274	Hospital	July	45	Widow	Parietal and omental	Clamp	9	5	Recovered.
275	Hospital	July	27	Married	None	Clamp	15	4	Recovered.
276	Hospital	July	35	Married	Parietal and omental	Clamp	28	5	Recovered.
277	Hospital	July	52	Married	Parietal	Clamp	12	4	Recovered.
278	Mr. Wright, Clapham Road	Aug.	48	Single	Parietal	Clamp	26	5	Died, 3rd day.
279	Hospital	Oct.	46	Single	Parietal	Clamp	17	5	Recovered.
280	Dr. J. Clarke	Oct.	41	Married	None	Clamp	15	4	Recovered.
281	Hospital	Oct.	47	Widow	Parietal and omental	Clamp	31	5	Recovered.
282	Hospital	Oct.	16	Single	Parietal and omental	Clamp	26	8	Recovered.
283	Dr. Morris	Oct.	39	Single	Parietal and omental	Clamp	19	5	Recovered.
284	Hospital	Oct.	35	Single	Parietal	Ligature	9	4	Died, 42 hours.
285	Dr. Grenser, Dresden	Oct.	28	Single	None	Cautery	55	4	Recovered.
286	Dr. Roberts, Manchester	Oct.	36	Married	Omental	Clamp	15	4	Recovered.
287	Hospital	Oct.	53	Married	Parietal, omental, and intestinal	Ligatures—both ovaries removed	23	5	Died, 23 hours.
288	Hospital	Oct.	45	Widow	Parietal and omental	Clamp	33	6	Died, 30 hours.
289	Dr. West	Nov.	31	Married	Parietal and omental	Clamp and ligatures—both ovaries removed	58	6	Died, 29 hours.
290	Hospital	Nov.	25	Single	None	Clamp	22	4	Died, 6th day.
291	Mr. Oldham, Brighton	Nov.	39	Married	Parietal and omental	Clamp	33	6	Died, 45 hours.
292	Mr. Keele, Southampton	Nov.	43	Single	None	Clamp	36	5	Died, 34 hours.
293	Dr. Ransom, Nottingham	Nov.	42	Married	None	Ligatures	30	4	Died, 40 hours.
294	Dr. Davies, Holywell	Nov.	41	Married	None	Clamp	13	4	Recovered.
295	Hospital	Dec.	43	Single	Parietal	Clamp	23	8	Recovered.
296	Hospital	Dec.	46	Married	Parietal	Ligature	7	5	Died, 56 hours.
297	Dr. A. Farre	Dec.	22	Single	None	Clamp	18	4	Died, 57 hours.
298	Dr. Attenburrow, Jersey	Dec.	46	Single	Parietal	Clamp	22	6	Died, 54 hours.
		1869.							
299	Hospital	Jan.	25	Single	None	Cautery	23	5	Recovered.
300	Sir T. Watson, Bart.	Jan.	28	Single	Parietal and omental	Clamp and ligatures.	28	7	Recovered.

SERIES II.—CASES IN WHICH OVARIOTOMY WAS COMMENCED BUT NOT COMPLETED.

No.	Medical attendant.	Date.	Age.	Condition.	History, &c.	Results.
		1867.				
1	Dr. Perkins, Exeter	April	48	Single	Incision made, and ovarian cyst emptied, but no attempt to remove the cyst was made, on account of extensive adhesions in pelvis and to cæcum.	Recovered as from a simple tapping. Feb. 1st, 1869, Dr. Perkins writes: "Her general health is tolerably good. I have tapped her 23 times in the last 21 months. Average, 11 pints."
2	Hospital	April	26	Single	Ovarian tumour exposed and tapped, and one cyst emptied. Bleeding vessels in cyst were tied, and the ligatures were cut off short and returned with the cyst.	Died on the 19th day, after suppuration of the cyst. P.M. examination proved that the tumour could not have been removed.
3	Hospital	May	43	Married	Cyst opened; some adhesions to parietes and intestines separated. Two vessels tied and ligatures returned.	Died 52 hours. The uterus, rectum, and both ovaries were so united that they could only be separated after death by careful dissection.
		1868.				
4	Chester Infirmary	May	25	Single	Ovarian cyst exposed and emptied; no attempt made to remove it, owing to extensive pelvic adhesions.	Relieved; left the Hospital; but died a few weeks afterwards.
5	Hospital	June	47	Married	Part of an adhering cyst removed; the remainder fixed to opening in abdominal wall, in the hope of a cure by suppuration and drainage.	Died, 4th day.
6	Mr. O'Connor, March ...	Aug.	33	Married	Ruptured cyst; peritoneal cavity cleansed from ovarian fluid; no attempt made to remove adherent dendritic tumour.	Recovered; went to March a fortnight after the operation; tapped by Mr. O'Connor in September and October; no collection of fluid after October, but some drainage of pus. January, 1869: "Has gained flesh, and is improving in health."
7	Dr. Worms, Paris	Oct.	33	Married	Adhering cyst emptied, fixed to abdominal wall, and drained.	Suppuration and recovery without dangerous symptoms; in February, 1869, in good health, though a few drops of pus still escaped daily.

Series III.—Cases where an Exploratory Incision was made.

1	Dr. Churchill, Dublin ...	1867. Aug.	48	Married	Large uterine fibroid exposed; punctured; bleeding vessels stopped by cautery and perchloride of iron.	Suppuration went on for several months, a drainage tube being fixed in the lower angle of the wound. The tumour gradually disappeared, and the patient is now well.
2	Dr. Evans, Birmingham	Oct.	43	Single	A fatty tumour of mesentery, exposed by incision, and wound closed.	Recovered from the incision. The tumour was afterwards removed. (See 'Pathological Transactions,' vol. xix, p. 243.)
3	Dr. Symonds, Clifton.....	Nov.	50	Single	A fibro-cystic tumour of the uterus; 7½ solid, 16½ fluid removed.	Died, 3rd day.
4	Mr. Keyser	1868. Feb.	30	Married	A renal or splenic cyst exposed, tapped, and drained.	Recovered, and remains well.
5	Dr. Garrod	Feb.	58	Married	Eight pints of sero-purulent fluid removed from a fibro-cystic uterine tumour, after exposing the tumour by incision.	Recovered, and remains well.
6	Hospital	Aug.	51	Widow	Incision made to examine a tumour surrounded by ascitic fluid; the fluid removed, but no attempt was made to remove a tumour, apparently cancerous, involving uterus and both ovaries.	Died, 10th day.
7	Dr. Williams, Sudbury ...	Nov.	32	Single	Renal cyst exposed, tapped, and drained.	Recovered; in January, 1869, "improving in health and strength every day."

The incomplete and exploratory operations recorded with the 200 completed cases in the previous papers amounted to eighteen, or about 9 per cent., and the fact that so many as fourteen accompany the present series of 100 cases, calls for some reply to what was formerly urged as one of the gravest objections to the principle of the operation. It was said, "Diagnosis is so uncertain that you can never tell before you begin an operation whether you will be able to finish it." The reply might be considered sufficient if I were to say that although these tables show a proportion of 7 incomplete to 100 completed operations, yet in only 2 of the 7 was death accelerated by the operation; 2 were as much relieved as by a tapping, and in 3 the prospects of complete recovery are very good. But I can give a far more complete reply, and I can assure the Society that when the details of the cases are studied, they show that in every patient, without exception, the unusual difficulty of the case had been foreseen, carefully considered in consultation, explained to the patient and her friends, and provided for before commencing the operation.

In the series of seven cases where an exploratory incision was made, there are two where I was much surprised to find the tumour was not ovarian. Even now, I do not think it would have been possible to avoid error, or to arrive at a correct diagnosis, without any exploratory incision. But in the other five cases of this series I was fully prepared for something unusual, and had arranged that the operation should be begun as an exploration. I think, therefore, it may be fairly argued that, as in 114 operations only 2 errors in diagnosis were made, and as these did not lead to any injury to the patient, the argument of any unavoidable imperfection in diagnosis as against the principle of the operation must be considered as completely refuted.

It is also satisfactory to find that with increasing experience the mortality has diminished.

Of the first 100 cases, 34 died and 66 recovered; of the second 100, 28 died and 72 recovered; of the third 100, 23 died and 77 recovered.

And a glance at the table will show that this mortality

would have been considerably less in the third hundred, had not ten fatal cases occurred in rapid succession towards the end of last year. I know that other London surgeons found that season remarkably unfavorable—that many patients died after trifling operations and after natural labours—and that unhealthy suppurative inflammation followed many injuries both severe and trifling. As soon as I became aware of this condition I refused to operate on any but the most urgent cases. Notwithstanding this exceptional drawback, the mortality has been less than in either of the previous series of 100 cases.

As experience has increased and the mortality after ovariotomy has diminished, professional opinion has been unsettled as to the use or propriety of tapping ovarian cysts. Some writers have gone so far as to assert that it is an operation which ought to be completely abandoned. Stilling, for example, in his work on the 'Extra-peritoneal Method of Ovariotomy,' says, page 161, that "*no surgeon should ever puncture an ovarian cyst. Tapping is a crime.*" He adds, "*Never tap.* Ovariotomy becomes more difficult the oftener a patient has been tapped before it, and the patient is made worse by every tapping."

Few surgeons here would go so far as this, but there are many who object to tapping on two grounds—first, that it is dangerous in itself and can only be of temporary utility; and secondly that it is likely to be followed by adhesions or other conditions which add greatly to the danger of subsequent ovariotomy.

In order to weigh the value of these objections to tapping, I have gone over the records of the 300 cases of completed ovariotomy, and have arranged in the following table the cases where tapping had never been practised, and where it had been performed from one to sixteen times.

	Cases.	Recoveries.	Deaths.	Mortality per cent.
Never tapped	135	98	37	27·40
Once tapped	78	58	20	25·64
Twice tapped	36	24	12	33·33
Three times tapped	19	14	5	26·32
Four „	9	6	3	
Five „	3	2	1	
Six „	5	2	3	
Seven „	2	2	...	
Eight „	4	3	1	33·33
Nine „	3	2	1	
Ten „	2	2	...	
Eleven „	1	...	1	
Fifteen „	1	1	...	
Sixteen „	2	1	1	
	300	215	85	

It may be seen that the general mortality of the 300 cases is 28·33 per cent.—and that 135 patients, or nearly one half, had never been tapped. In them the mortality is 27·40 per cent., not 1 per cent. less than the general mortality. In other words, the mere fact that a patient has or has not been tapped (so far as can be judged from 300 cases in the hands of the same operator) does not affect the result of the operation by so much as 1 per cent. Indeed the mortality of the patients not tapped, though less by about 5 per cent. than that of the patients who had been tapped twice, is greater than that of the patients who had been tapped once and three times. Thus 78—or rather more than a fourth—had been tapped once, and the mortality was 25·64 per cent. Of nineteen who were tapped three times, the mortality was 26·32

per cent. Of the 36 who were tapped twice, the mortality was exactly the same as that of the group of cases tapped from 4 to 16 times, namely 33·33 per cent.—or 1 in 3.

It may be taken then as almost certain that the mortality of ovariotomy is but little affected by tapping—that the fact of a patient not having been tapped, or having been tapped very often, is by itself of little or no value in prognosis. I have shown in a former paper that such adhesions as are apt to follow tapping have no appreciable effect upon the mortality after ovariotomy; and I can now add that in some of the patients who had been tapped most frequently there were no adhesions, and there were firm adhesions in some who had never been tapped.

In considering the objection to tapping on the ground of its danger, as compared with the danger of ovariotomy, some writers appear to me to have fallen into great error. They take a certain number of cases of ovarian disease, and say that so many patients died after one tapping, so many after five, six, or ten, and conclude that tapping is a very fatal operation. I have heard it gravely asserted that it is a more fatal operation than ovariotomy, because after ovariotomy, a third or more of the patients recover; while, after tapping, sooner or later, they all die. But the very important distinction is overlooked between an operation which either cures or kills, and one which only fails to save life, or kills only under most exceptional circumstances.

It is seldom that a surgeon is called upon to perform ovariotomy in order to save a patient from imminent death. But this does occasionally happen. Dr. Wiltshire and Dr. Watson have published a case, where a woman who was dying from bleeding into an ovarian cyst, was saved by immediate ovariotomy. I have been sent for twice to operate under similar circumstances, but both patients were dead before I arrived. In both, large veins had burst, and some pounds of blood were found inside ovarian cysts. If, in any of these cases, the death of the patient had followed ovariotomy, it could hardly be said that this operation had killed the patient; it had only failed to save life. So, if a patient

be near death, poisoned by an ovarian tumour in a state of gangrene from a twist in the pedicle, or by the fetid contents of a suppurating cyst, ovariotomy, if performed unsuccessfully, can only be said to fail in saving life. It cannot be said to kill. Yet I have operated successfully under such desperate circumstances; and more than once when rupture of a cyst into the peritoneal cavity had been followed by diffuse peritonitis. In any such case, ovariotomy must be compared with trephining, tracheotomy, herniotomy, or the ligature of some large artery in a case of wound or burst aneurism, or primary amputation of a limb in compound fracture. It is not the operation which is the cause of death, but the disease or accident from the effects of which the patient is not saved by the operation.

But such cases as those just alluded to must be very rare exceptions to the large majority in which ovariotomy becomes the subject of consultation. There is generally as much time for discussion as in the parallel case of lithotomy in the male adult. And in both cases, the responsibility of operating with the full knowledge that if the patient be not saved by the operation he or she is killed by it, must be fairly faced. It is true that death would almost always be caused by the stone or the ovarian tumour, but it might be at a distant period, and if death follow the operation in a few days, the operation must be almost always the cause of death.

Tapping stands on a totally different ground. As a rule, when a patient dies after tapping, it is not because tapping has hastened her death, but simply has not succeeded in saving her life. Her life may have been prolonged by repeated tappings, but at last she dies worn out by the disease.

In a future paper I hope to bring before the Society the results of tapping in cases where ovariotomy has not been performed. At present I must limit these remarks to the relation which one operation bears to the other, and I think I have already brought forward a sufficient number of facts to warrant the acceptance of the following propositions.

1. That one or many tappings do not increase considerably the mortality of ovariotomy.

2. That tapping may often be a useful prelude to ovariotomy, either as a means of gaining time for a patient's general health to recover, or of lessening shock by removing the fluid a few hours or days before removing the solid portion of an ovarian cyst; and

3. That when the syphon-trochar, which I brought before the Society in 1860, is carefully used, in such a manner as to prevent the escape of ovarian fluid into the peritoneal cavity, and the entrance of air into the cyst, the danger of tapping is extremely small.

NEPHROTOMY

AS A MEANS OF

TREATING RENAL CALCULUS.

BY

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Received Feb. 17th.—Read April 27th, 1869.

THE object of the following communication is to introduce to the notice of the Society, for discussion and consideration, a method of treating stones in the kidney and ureter, that is, I think, worthy of more thoughtful deliberation than it has hitherto received. I, indeed, owe the Society an apology for bringing before it a paper on a somewhat novel method of treatment, without, at the same time, detailing some personal experience of the proceeding the paper discusses.

Having, however, waited in vain for more than two years for an opportunity of putting the operation of nephrotomy to the test of experience, I am induced to publish the following short and incomplete communication, in the hope that the suggestions it contains may receive the benefit of further consideration by others of more mature judgment

than myself; while, perhaps, their opportunities of practice may give occasion for testing the success of the operation herein described, should it be thought worth a trial.

The operation of nephrotomy, though mentioned and recommended by Hippocrates with certain reservation, was by him and his followers restricted to cases in which there was an external swelling—cases in which, as they expressed it, nature showed the way. This, one may suppose, would include cases of calculous impaction of the ureter, with dilatation of the ureter or kidney sufficient to cause an external swelling; it would also refer to renal abscess, or renal fistula. In this limited application, the operation of nephrotomy has been but rarely performed, and I am not aware that in these operations the extraction of calculi has ever been methodically attempted; although the details of a case will presently be given where calculi were successfully removed from the kidney by the operation of nephrotomy.

To justify the attempt to remove a stone from the kidney by operation, it is most desirable—1st, that we should be able to recognise, with some certainty, the presence of the calculus; and 2ndly, that we should possess a plan of operation by which the stone can be removed without more risk to the patient's life than the gravity of the disease, and the severity of his sufferings, warrant us in incurring.

With regard to the first condition, I believe that, at least in children, we can recognise[1] the presence of stones in the pelvis of the kidney by tactile examination, that is to say, of stones of sufficient size to need operative interference; while to confirm the diagnosis, and give it practical efficiency, there are the ordinary symptoms of renal calculus which must coexist.

For the physical examination of the kidney it is well that the bowels should be previously cleared by an aperient, and the patient should lie on his back, his knees being drawn up and supported in that position. The surgeon placing the

[1] I say children because my observations have been chiefly carried on at the Children's Hospital. I cannot doubt, however, that this statement would hold good for some adults.

fingers of one hand on the lumbar region, just below the last rib and outside the erector spinæ muscle, may press the kidney gently forwards from behind; while with the thumb of the same hand, or with the fingers of the opposite hand, he should press in the hypochondriac region in front, as near the lower margin of the ribs as possible. This pressure should be gentle at first, but continuous and increasing, especially during expiration, until the resistance is met with, and the outline recognised that characterises the kidney. For appreciating irregularities of outline on the surface, or in the pelvis of the kidney, it is best to pass the fingers or thumb from above downwards, over the front surface of the organ. This examination may be made in most instances without the aid of chloroform; while in others, chloroform is advisable to relax the abdominal muscles, and overcome the turbulence of the patient.[1]

In the two following cases the plan above described was employed, with the result of detecting in one case, as I believe, the presence of a renal calculus, and in the other, the existence of a tubercular deposit in the infundibulum of the kidney and commencement of the ureter. The history of this first case was kindly furnished me by Dr. Gee. It is as follows :—

A. A—, æt. 9, has had pain in the right hypochondrium at intervals for four years; pain greater of late. Bowels regular. No jaundice. The pain has been supposed to be a gastrodynia, and treated accordingly.

May 20, 1864.—The patient is fairly well nourished; not pale. He has daily paroxysms of pain in the right hypochondrium, immediately under the costal cartilages, and a little to the right of the right nipple line; also behind, just below the last rib and outside the mass of lumbar muscles; each paroxysm lasts three to four hours, but is not accompanied by vomiting. He says (and he can be trusted) that he has pains at times about the right external malleolus,

[1] A full and detailed account of the method of examining the kidney by palpation is given by Sir W. Jenner, 'Brit. Med. Jour.,' 1869, vol. i, p. 42.

and also about the upper third of the right thigh. When pain is present the belly is much retracted, and the boy curls up to get relief; the sites of the pain are very tender. No disease of the spine or ribs can be made out; no pyrexia; no derangement of the alimentary canal. Heart and lungs natural.

When he is not suffering pain, by passing the right hand under his body as he lies in bed and pressing the fingers upwards outside the lumbar mass, at the same time pressing the fingers of the left hand downwards in front, about the position of the spontaneous pain, and thus bringing the points of the fingers together under the liver, an indistinctly defined solid mass can be felt; it is about the size of a thumb, rounded, not soft, and when squeezed causes a peculiar sensation in the epigastrium, which is apparently painful, and yet not, the boy says, a pain. This tumour does not feel at all like intestine, and it cannot be traced downwards.

The urine looks natural, yet it contains a considerable quantity of albumen; the microscope shows a few blood discs, but no casts or epithelium.

June 8.—There had been no pain since the last note until yesterday, and the albumen had quite disappeared from the urine. Yesterday at midday the pain returned; it was seated between the costal margin and the umbilical level, a little to the right of the middle line; the pain was sometimes more severe than at others, and it did not seem to radiate at all. No vomiting; tongue clean. The tumour was very perceptible just outside the rectus abdominis muscle in front, and the quadratus lumborum behind, reaching almost up to the costal margin, and about two inches and a half downwards; its lower border was not perceptible. The tumour was rounded, about an inch broad apparently; when squeezed he felt much pain. The urine was notably albuminous.

He was now put upon large doses of citrate of potash, so as to render the urine alkaline.

August 22.—The patient was fat and cheerful, he has not had any severe pain for two months, nor even slight

pain for four weeks. The tumour cannot now be felt; but when pressure is made in its position, he has decided epigastric pain. Urine clear, yellow, alkaline, no trace of albumen. In the sediment of the urine which he passed after I had examined him, there were undoubted blood discs.

May 14, 1866.—He is looking tolerably well, but occasionally has intense pain, which "reduces him terribly."

Not seen again.

I am indebted to Dr. West for the notes of the following case.

W. S—, æt. 4½, was admitted into the Children's Hospital, Feb. 8th, 1868, under my care. He was a workhouse orphan farmed out by the parish to an old woman, who stated that two months ago the child first passed blood with his water, and that again during the last five days she had noticed the blood.

On admission he was suffering great pain, coming on just before, and continuing during, micturition. He cannot hold his water for any length of time, and he seems in great pain before the water begins to flow, but this pain subsides and he has none afterwards. He has prolapsus ani, but does not pull the foreskin or pinch the glans penis; as far as can be ascertained he has no pain in the loins or inside the thighs. The urine contains a large quantity of blood of a bright colour; under the microscope pus cells were seen, there were no casts of tubes. He was sounded under chloroform, but no stone was found; blood flowed from the urethra directly the sound entered the bladder. The case was transferred to Dr. West.

February 14th.—He was examined by Dr. West, and myself, under chloroform, and a round swelling was detected by palpation in the right lumbar region in the situation of the pelvis of the corresponding kidney; this swelling seemed about the size of a filbert; it was firm but scarcely so hard as a calculus should have been, it was slightly movable and was thought to be probably a renal calculus.

Under remedies the quantity of blood in the urine diminished, but the pus increased, and the pain which at first only preceded urination became almost constant. The child lost flesh and strength, and the urine could scarcely be retained at all.

March 9th.—He was again examined under chloroform, and for the first time a small swelling was detected in the opposite lumbar region apparently connected with the left kidney. This was smaller, softer, and less definite, than the swelling in the right loin; it was evidently not a renal calculus; its existence and consistence threw much doubt upon the nature of the swelling in the right kidney. At the same time the vesical symptoms became so urgent as to make us believe that the child was suffering from tubercular disease of the urinary mucous membrane.

On April 2nd, two months after admission, the child died, worn out by pain or hæmaturia and discharge of pus with his urine.

Post-mortem examination.—The mucous membrane of the bladder was intensely congested, rough, and about the orifice of the left ureter villous and swollen.

Right ureter was thickened in its walls; its upper end was much enlarged by deposit beneath the mucous coat forming the swelling felt during life, its calibre was natural.

Left ureter was greatly distended with urine, apparently owing to obstruction at its vesical orifice.

The mucous membrane of the pelvis and calices of the right kidney was thickened, here and there ulcerated and smeared over with yellow strumous deposit; the tubular texture of the gland was ulcerated in places; softening tubercle was found scattered throughout the cortical substance.

The left kidney was in a much less advanced stage of the same disease.

Since the occurrence of the foregoing case no patient has come under my care with symptoms of renal calculus sufficiently pronounced to make it worth while instituting a methodical examination of the kidney by palpation.

It is likely that the most searching physical examination of the kidney would fail to detect a calculus in the case of corpulent or very muscular adults. It is also probable that small stones would escape detection even in children; yet I believe there are many cases of renal calculus in which the stone would be capable of recognition by examination after the manner that I have described. Should it be impossible to employ this method of examination of the kidney, owing to the conformation of the patient or some other unfavorable circumstance, I would submit for consideration and discussion whether in some cases of renal calculus the subjective symptoms alone are not so pathognomic, that the diagnosis might be considered sufficiently clear to proceed to operation, especially since (as I believe) by the plan of operation recommended in this paper, the kidney could be made the subject of tactile examination without serious danger to life.

For some time I was under the impression that nephrotomy for the extraction of calculus (where there were no external indications) had never been attempted; I am indebted to the kindness of Dr. Wiltshire for more accurate information on this point. In the nineteenth volume of the 'Philosophical Transactions' is the following account, which I quote from the third vol. of the abridgment by John Lowthorpe, p. 191. The paper is headed "The way of cutting for the stone in the kidney, by Mr. Charles Bernard."

"Mr. Hobson, who was Consul for the English at Venice, having been long afflicted with stone in the kidney, was at length attacked with a fit of that duration and violence that it reduced him almost to desperation; and finding no relief from any means that had been used, he addressed himself to Dominicus de Marchetti, a famed and experienced physician at Padua, imploring him that he would be pleased to cut the stone out of his kidney, being fixed in his belief that no other method remained capable of relieving him, adding that he was not insensible of the danger but that death itself would be infinitely more eligible than a life of that misery under which he had long, and did then, groan. Marchetti seemed very desirous to have declined it, representing not only the

extreme hazard, but, as he feared, the impracticableness of the operation; that it was what he had never attempted, and that to proceed to it was in effect to destroy him. But Mr. Hobson persisting that if he refused, he would never desist until he found out some one who would do it, Marchetti was at length, by his resolution and importunity, prevailed upon to undertake the operation; and having prepared his patient, as he thought convenient, he began with his knife cutting gradually upon the region of the kidney affected, so long till the blood disturbed and blinded his work, so that he could not finish it at that attempt. Wherefore dressing up the wound till the next day he then repeated it, and accomplished it by cutting into the body of the kidney, and taking thence two or three small stones he dressed it up again. From this instant Mr. Hobson was freed from the severity of his pain, and in a reasonable time was able to walk about his chamber, having been in no danger either from flow of blood or fever. Marchetti continued to dress the wound for a considerable time, but was not able to close it up; it soon became fistulous from the continual flowing of urine through the sinus; but being in other respects restored to his former health and vigour, and the matter discharged being little, Mr. Hobson took leave of the professor and returned to Venice under the care and management of his wife, who, one morning as she was dressing the sore, fancied she felt something hard and rugged as she wiped it; upon which examining a little more carefully with her bodkin, which served her instead of a probe, she found it to be a stone of the figure and magnitude of a date-stone, which being removed, he never afterwards complained of the least uneasiness in that part.

"About ten years afterwards he returned to London, where the learned Dr. Tyson, and myself, were by Dr. Downs, who had known him formerly in Venice, invited to see him. And after we had received the foregoing account from himself, he gave us the satisfaction of viewing the sore which continued open. Mr. Hobson, without any complaint, permitted me to pass my probe so far into the sinus that we concluded it reached into the kidney. The matter it then discharged was

but little in quantity but always diluted with, and smelling strongly of, urine. The orifice would sometimes close for three or four days together, and then the matter made its way through the common passages with the urine, yet without any difficulty or pain. There was no question but that there was a coalition of the kidney and the psoas muscle. When we saw Mr. Hobson he was as able in appearance to perform the functions of life and to undergo any fatigue as any man of his years (being then I conceive upwards of fifty), and was the next day to ride post forty or fifty miles."

To this account of Mr. Hobson's case the narrative adds a learned discussion on the originator of the operation of nephrotomy, the sum of which is the following. That Hippocrates recommended the practice of nephrotomy only when an external swelling existed. That we have no manner of evidence that cutting into the kidney for the removal of stones was practised in his time or in many ages after. That both Celsus and Galen are silent in this matter. That a certain Serapion, who lived some time between the seventh and eleventh centuries, mentions the operation only to condemn it. That in the thirteenth century Avicen speaks of the operation as a dangerous one. Much later, a certain Rosetti recommended it, though he never seems to have practised it himself nor to have induced others to do so.

Mr. Charles Bernard concludes the history of Mr. Hobson's case with the following remark—"that though it is the opinion of those authors who have treated of wounds of the kidney, that if they penetrate the pelvis they terminate in death; yet that the result of the case related shows us that they ought not to have so magisterially exploded the operation."

The following is the operation by which I propose to extract calculi from the pelvis of the kidney. The patient being in the prone position a longitudinal incision should be made along the outer border of the erector spinæ muscle, beginning at the lower margin of the last rib, and extending downwards for four inches towards the ilium.

The skin and fascia, the latissimus dorsi, the serratus posticus inferior, and a layer of the fascia transversalis, being divided, the quadratus lumborum muscle is exposed, this with the erector spinæ should be drawn towards the middle line with a retractor, and the body of the kidney will come fully into view; the fascia surrounding it being laid open, the finger can be passed inwards, so as to touch the hilus of the kidney and feel the commencement of the ureter and pelvis.

In this operation one or two lumbar intercostal arteries will be met with and would require division and ligature; the ilio-lumbar nerve might also be cut.

There is little difficulty in reaching the pelvis of the kidney by the proceeding above described and without incurring any serious risk; whether, however, a stone could be extracted without undue violence to the renal tissue, can only be ascertained by performing the operation where a stone exists.

I have seen renal calculi in children situated in the pelvis of the kidney and freely movable, which I can scarcely doubt could have been removed during life. Again, there are instances of long existing and branched stones in adults which could scarcely be removed without inflicting unjustifiable violence on the kidney or its surroundings. The position, shape, and connections, of the stone or stones would materially affect the facility of their extraction. It is therefore, on all considerations, highly desirable that the operation of nephrotomy should be performed on the dead body of a patient, dying with renal calculus, before putting it in practice on the living.

The operation above described will, at least as I believe, enable us to ascertain enough of the position, size, and connections, of the calculus, to judge whether its extraction should be proceeded with. The operation could be abandoned if, after introducing the finger and examining the kidney, it seemed unadvisable to attempt the removal of the stone; nor do I think that an exploratory proceeding such as I have suggested would put the patient's life in any serious danger.

The objections that may be raised to the operation of

nephrotomy are first, in respect of its difficulties, and next in respect of its dangers.

The *difficulties* of exposing the kidney effectually, so as to examine it, though considerable, are, to my mind, not insuperable; they would vary greatly in degree in proportion to the thickness of the fleshy parts to be cut through, and the amount of sub-renal fat met with. They would vary also as the kidney or ureter might be found dilated or otherwise. Dilatation of the kidney or upper part of the ureter from an impacted calculus would greatly facilitate the operation; and though in such a case it would be likely that the renal tissue would be seriously disorganised, still even then there would be more chance of a sound and efficient kidney on the opposite side than in cases of long-standing vesical calculus where both kidneys are commonly disorganised.

The difficulty of extracting a stone or stones from the kidney would depend upon conditions that have been already mentioned, and would (as I venture to think) in some cases prove insuperable. Still, it is to be hoped that so much of the position, size, mobility, and shape, of the stone could be ascertained by examination with the forefinger through the wound in the soft parts, as to enable the surgeon to stop short of opening the kidney in the event of its being thought unadvisable to attempt the extraction.

The dangers of this operation would, as we may suppose, chiefly arise from hæmorrhage, from incision or laceration of the renal tissue, and from extravasation of urine. It is almost certain that a simple wound of the pelvis of the kidney or commencement of the ureter would cause very inconsiderable loss of blood, and that it is only in cases where the secreting structure of the kidney itself was wounded that any serious hæmorrhage would be likely to ensue. This danger is probably not so great as one would imagine; in the case of Mr. Hobson, quoted in this paper, it cannot be doubted that the kidney was freely cut into; and as bearing on this question I may briefly mention the case of a boy, æt. 14, who was admitted into St. Bartholomew's Hospital under Mr. Paget, on May 8th, 1864. He had fallen forty feet from

the top of a house on to a heap of brick rubbish and old iron. There was a large wound in the right loin dividing the erector spinæ muscle; through this wound a portion of the kidney as large as a walnut protruded, a piece of its substance had been chipped out, leaving a gap which would admit the end of the finger. The wounded surface of the organ had a fibrous appearance, it did not bleed but distilled urine; and the whole exposed portion seemed to have been deprived of its capsule. This patient suffered severely for some days from inflammation of the peritoneal surface of the diaphragm; on the sixth day his general condition improved, there was a free discharge of urine from the wound, which contained no blood; on the sixteenth day the exposed parts were granulating, and after the ninth week urine ceased to flow from the wound. The patient completely recovered, and was able again to resume active work. In this case the wound in the kidney was not of a contused character, so as to account for the absence of hæmorrhage, for Mr. Vernon's account (in the second volume of the 'St. Bartholomew's Hospital Reports') expressly states that a piece of the organ had been "chipped off." It is also noteworthy, as bearing on the same point, that the wound of the kidney, though it did not bleed, from the very first gave exit to urine.

Notwithstanding the experience derived from the two cases quoted, I imagine that no prudent surgeon would willingly cut freely into the secreting structure of an undilated kidney for the removal of a stone; but would hesitate to attempt the extraction of any stone that appeared fixed in the substance of the organ, and that could not be approached through the hilus. In a kidney much dilated, however, the amount of secreting structure to be cut through to reach a stone might be reduced to a very thin and but slightly vascular layer.

I think that, without presumption, one might assume the danger to life from extravasation of urine would not be great after nephrotomy, since there would be so free an exit for urine through the external wound.

In conclusion, I would venture to repeat that, before at-

tempting the operation on the living, the possibility of removing renal calculi by nephrotomy should first be decided by operation on the body of one who has died with a stone in the kidney. I hope that this experience may shortly be forthcoming, either by others performing the operation themselves on patients who may have died with renal calculus, or by the kindness of some surgeon giving me an opportunity of operating under similar circumstances.

ON THE

TREATMENT OF PHTHISIS

BY

PROLONGED RESIDENCE IN ELEVATED REGIONS.

BY

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Received Feb. 15th.—Read May 11th, 1869.

Our views of the nature of pulmonary consumption and tuberculosis, are so much in a state of transition, that the same term is used by different authors in a different sense. I therefore premise that I employ the old and simple term phthisis to signify, not only tubercular consumption, but also those other morbid conditions of the lungs which tend towards pulmonary consumption, and especially the various consequences of acute and chronic catarrhal or lobular pneumonia, so well described by the late Dr. Thomas Addison,[1] whose teaching "that inflammation constitutes the great instrument of destruction in every form of phthisis," was for a long time either ignored, or regarded as erroneous, by most of his contemporaries, as well in this country as

[1] "On the Pathology of Phthisis." By T. Addison, M.D. 'Guy's Hospital Reports,' 2nd series, No. V, 1845, p. 1; and New Sydenham Society's Collection of the published writings of Thomas Addison, M.D., 1868, p. 39.

abroad, because it was opposed to Laennec's views, which had taken hold of the minds of medical men in an almost incredible manner. Happily a change is being worked in this respect by some of the best observers, as well English as German.

The term "elevated regions" is used in this communication instead of the expression "Alpine climates" employed in a former paper,[1] because the elevated places where consumption may be cured, need not belong to the great alpine chains of Europe, America, and Asia, but may be situated on a lower level. The term is intended to comprise those localities where, owing principally, but not entirely, to their elevation, phthisis is either absent, or of rare occurrence amongst the inhabitants. The elevation, necessary for producing a certain degree of immunity from phthisis, varies considerably in different latitudes, and seems to become lower in proportion as we proceed from the equator towards the poles; thus in the tropical zone it may be regarded as above 8500 to 9500 feet, while in the temperate zone it is considerably lower. In the Peruvian Andes, between about the 8th and 15th° S. Lat, an elevation of immunity from phthisis lies above about 7500 and 8500, according to personal communications from Dr. Archibald Smith, who practised during twenty-five years at Lima, Cerro Pasco, and Huanuco; in Mexico, between about 20° and 30° of N. Lat., it lies, according to Jourdanet and other authors, above 6500 and 7000 feet; on the Sierra de Cordova, about 30° to 32° S. Lat., phthisis does not, or rarely, occur, according to a communication from Dr. Scrivener, not yet published, already at a much lower elevation; and Dr. Scrivener adds, "that it has been the custom from time immemorial, for the physicians in Buenos Ayres, to send their consumptive patients from the coast to the mountains." Quite lately I have learnt from an intelligent native of Kiachta, in Siberia, on the Chinese frontier, that consumption does not occur in that town, elevated, according to 'Blackie's Imperial

[1] "On the Influence of the Alpine Climates on Pulmonary Consumption," 'Brit. Med. Journal,' 1867, vol. ii.

Gazetteer,' 2220 feet above sea-level, and situated in lat. 50° 15′ N., lon. 105° 40′ E.

In the Pyrenees, 42° to 43° 5′ N. Lat., there are not many inhabited places of high elevation, but according to Schnepp's statement, it is already rare at Eaux Bonnes, 2450 feet, and Eaux Chaudes, about 2205, above the sea, and the result of personal inquiries made many years ago at Garvarnie 4580, Barèges 4100, Cauterets 3254, San Sauveur 3552, Bagnères de Luchon 2060, Bagnères de Bigorres 1760 feet above sea-level, is in accordance with this statement, viz., that phthisis is not absent amongst the inhabitants, but is decidedly less frequent than in the adjacent plains of France. In Switzerland, between 46° and 48° N. Lat., the frequency of phthisis, according to the statement of many local medical men, diminishes in most parts above 3000 feet, and it becomes very rare above 5000 feet. In the Black Forest, between 27° and 49° N. Lat., it is comparatively rare above 2500, and in the mountains of Silesia, Thüringen, and the Harz, 50° to 52° N. Lat., between 1400 to 1600. Fuchs[1] states that at Brotterode, in Thüringen, 1840 feet above sea-level, the percentage of phthisis is only 0·9, and Brehmer[2] assures us that in the neighbourhood of Görbersdorf, in Silesia (1700 feet) he has never seen phthisis amongst the inhabitants. Virchow[3] mentions that it is rare in the Spessart, the highest villages of which mountain range are from 1000 to 1400 feet above sea-level. Küchenmeister,[4] in a valuable contribution on the subject, endeavours to fix the elevation of immunity from phthisis, for every degree and fraction of a degree of north or south latitude, and from calculation is inclined to assume, that for the latitude of Germany and Switzerland the removal of one degree from south to north, would render the necessary elevation about 375 feet lower, while the removal in

[1] 'Medicinische Geographie,' 1853, p. 35.

[2] 'Die chronische Lungenschwindsucht.' Berlin, 1857, p. 134.

[3] "Die Noth im Spessart," 'Würzburger Verhandlungen,' vol. iii, 1852, p. 128.

[4] "Die hochgelegenen Plateaus als Sanatorien für Schwindsüchtige," von Dr. Friedrich Küchenmeister." Separatabdruck aus der 'Oesterreich. Zeitschrift für practische Heilkunde.' Wien, 1868, p. 17.

the southward direction would require a greater elevation, viz., for an entire degree of 375 feet, for $\frac{1}{6}$ degree of $62\frac{1}{2}$ feet, for $\frac{1}{10}$ degree of $37\frac{1}{2}$ feet. Küchenmeister has even proposed a map, marking on the margin the elevation of immunity for every 6th part of a degree; he claims, however, himself only approximative correctness, and suggests the formation of an association of medical men for examining the relative frequency of phthisis in different elevations in Germany and Austria, according to the degree, and fractions of a degree, of latitude. Küchenmeister will do good service, indeed, if he can carry out this scheme, and if he can extend the examination also to other diseases and causes of death in different elevations. It appears to me, however, scarcely probable[1] that a fixed elevation of immunity will be found for every degree of latitude, decreasing in an arithmetical proportion from the equator towards the poles, and *vice versâ*. Even in the same mountain range there are differences in this respect. Thus, I have learnt from Dr. Unger at Davos, that Dr. Boner, of Klosters, not rarely met with phthisis at Splügen (over 4700 feet), where he formerly practised, while it scarcely ever occurred to him in the upper part of Klosters (rather below 4000 feet); and at Andermatt (about 4700 feet) I have likewise ascertained the occasional occurrence of phthisis. Elevation, though probably a most important, is not the only cause at work, but there are other influences which may either assist or counteract it, as the situation of a place on table land, on the top of a hill, on the slope, or in a valley; the aspect to the south, west, north, or east; the configuration, and height of the surrounding mountains, if there are any, on which the stillness or motion of the atmosphere, and the direction of the currents, and the amount of light and sun, so greatly depend; the nearness or absence of sheets of standing water, or rivers, or marshy districts, the elevation of the residence

[1] I ought to state that Küchenmeister mentions in a letter, written subsequently to the publication of the paper quoted, that he likewise considers elevation only as *one* of the influences at work in the immunity from phthisis on high elevations.

above them; the neighbourhood of the sea; the proximity of large glaciers and snowfields; the occurrence or absence of fogs; the number of clear days; the amount of rain or snow, and the degree of humidity of the air. Subjects of special importance are the nature of the geological substratum, and the other conditions on which the dryness or dampness of the soil depends. The researches of Bowditch in America, and of G. Buchanan[1] in England, have quite lately thrown a new light on these questions. The fact that each of these two observers was unaware of the researches in which the other was engaged, and that they arrived at analogous results, increases the value of the latter. The diminution of phthisis mortality in many towns following almost immediately the drying up of the soil by improved drainage; and the further fact, resulting from Dr. Buchanan's inquiries, that less phthisis exists in the same countries among populations living on pervious soils, than among populations living on impervious soils, give great force to the conclusion, drawn as well by Mr. Simon, as by Dr. Buchanan himself, "that wetness of soil is a cause of phthisis to the population living upon it."[2] I might mention many other circumstances which, though generally not much considered, seem to me of great importance, as the manner of cultivation of the land, whether barren rock, with little grass, or covered with wood, or with pasture land, or with corn, etc.; the scarcity or density of population, and the nature of their occupations; the usual admixtures to the air, mechanical, chemical, and living; and further, the fact, whether a place is situated on a mountain range of limited dimensions, forming a more or less isolated elevation, or whether it belongs to an extensive mountain country, like the Alps or the Cordilleras, a fact by which the temperature, the moisture of the air, the nature of the winds, and other agents are considerably influenced. It may, perhaps, be

[1] 'Ninth and Tenth Reports of the Medical Officers of the Privy Council for 1866 and 1867.'

[2] 'Tenth Report of the Medical Officers of the Privy Council,' p. 16 and p. 109.

found that in a district deprived of high and massive mountains, a less elevation, sufficiently raised above the atmosphere of the lower districts, may procure the same degree of immunity as is due only to a higher elevation in another district provided with extensive and high mountain regions.

It is not impossible that elevation acts by favouring a certain constitution of the air, viz., a great degree of freeness, from deleterious admixtures, organic and inorganic, and that dryness of soil and air, cold, and other influences, act in the same direction.

I have not yet been able to learn the result of the researches of the Swiss Society of naturalists and medical men, on the prevalence or absence of consumption in the various parts of Switzerland; but as some of the best observers are engaged in the inquiry,—Lombard, of Geneva, among them —we may look forward to important information from their report on many of the questions alluded to.

I need not tell the Fellows of the Royal Medical and Chirurgical Society that there is nothing new in the idea of treating consumptive patients by a residence in elevated localities. The views of Archibald Smith, Lombard, Mühry, Hirsch, Jourdanet, Guilbert, and others,[1] are well known to them; but they will agree with me in saying that there is still a very strong prejudice, as well among the majority of the medical men as the public of this country, against giving a trial to the plan in question. In almost every case of incipient consumption in which I have advised a prolonged residence in St. Moritz, or Davos, or any other elevated region, it has happened that either the one or other of the relatives, or a medical man connected with the family, strongly objected to the plan because he thought it "injudicious to expose so delicate an invalid to a rough and cold climate," or "to place one predisposed to pulmonary hæmorrhage under the

[1] It is an act of justice to mention here that Dr. Brehmer, of Görbersdorf, was, to my knowledge, one of the first medical men in Europe who has carried out this idea in a systematic manner. He did not keep the patients during the cold winter months in high elevations, but he strongly advocated the plan for the milder seasons. 'Die chronische Lungenschwindsucht.' Berlin, 1857.

influence of a rarified air;" and in many instances, I confess, the objections had greater power than my advice. It is not my business to inquire how they fared in warmer and lower climates, but I can conscientiously say that at least no harm has arisen, that, with scarcely any exceptions, even great benefit has accrued to those who have given a fair trial to the elevated regions, as an examination of all the cases will prove.

Amongst the different objections, the two I have just mentioned seem to be the most prominent in the minds of most people; and yet I believe that before long it will be counted among the errors of the past—1st, that cold is injurious to those predisposed to consumption, or to those already exhibiting the signs of an early stage of the disease; and 2nd, that the moderately rarified air of a mountain health resort predisposes to pulmonary hæmorrhage; and I may mention also at once,—3rd, that popular idea that climates with a uniformly warm temperature are the best for consumptive people.

Cold can surely not be called a direct cause of phthisis; people may be, it is true, deprived by it of the means of obtaining food and clothing, and may be induced by it to crowd together in close, ill-ventilated rooms, and altogether to avoid out-door exercise; but if, under such conditions, a tendency to catarrhal inflammations and consumption is developed, it is clearly not to be ascribed to the low degree of temperature. A cold, dry air with a clear sky causes, when there is no want of clothing and food, an inclination to exercise, and to increased breathing; the mind becomes cheerful, the appetite and the nutrition improved, and the tendency to consumption is thus counteracted. In colder climates consumption is rarer, and less rapid in its course than in hot climates; we need only point to the great frequency and almost acute character of the disease, in the low and hot parts of Mexico, and at Panama,—of which latter place E. H. Richter,[1] in his excellent report on

[1] "Bericht über Medicinische Meteorologie und Klimatologie," Schmidt's 'Jahrbücher,' vol. cxxii, cxxviii, cxxxii, and cxxxiii.

'Medical Climatology,' truly says that few spots on earth have greater equability in the atmospheric pressure and in the temperature.

It has repeatedly been mentioned to me that consumptive people have been sent from warmer to colder regions, but I cannot remember the source of my information. Quite lately, however, I have learnt from Dr. H. Hunt, of Brook Street, that he has, to use his own words, "seen the greatest benefit from the residence in Labrador, and in the outlying fishing stations in Newfoundland, in strumous tubercular diathesis;" and I have had myself the opportunity of examining a German, about thirty years of age, who, after having in his native country suffered for several years from frequent catarrhal inflammations, offered the signs of deposits in both apices, coupled with considerable emaciation, when he received an appointment on the coast of Labrador, from whence he returned, after four years' stay, in robust health, having been free from cough for more than two years, and with but slight traces (flattening of the subclavicular region) of the former affection.

The fear of *hæmorrhage* in elevated health resorts seems to be based on the well-known theoretical reasoning on the influence of diminished atmospheric pressure, strengthened by the reports of Saussure, Humboldt, Boussingault, and other scientific explorers; but the heights where bleeding from the nose and gums occurred to them, were much greater than those recommended to consumptive patients; and what is still more, these men and their attendants had to make excessive exertions in ascending steep rocks and snow slopes. And whoever knows the violent palpitations of the heart caused by great ascents in those who are not quite in "condition," cannot be astonished at the occasional oozing of blood from their mucous membranes. Yet the best guides in Switzerland, the constant companions of our alpine climbers, can bear me out in saying, that even this is very rare, —at least, in the ascents of mountains of 13,000 to 15,000 feet; but even if it were frequent under such circumstances, it is evident that they are totally different from those in which

the invalid is placed who takes his limited exercise on almost level, or only moderately rising ground.

Independently, however, of such considerations, experience appears to be in favour of the view that hæmoptysis in consumptive people is less frequent in elevated, and usually colder, than in low, and generally warmer health resorts. Archibald Smith[1] teaches us that in Lima, where hæmoptysis is one of the most frequent affections, and the usual forerunner of phthisis, the removal to the mountain health resorts, about 9000 to 12,000 feet above sea-level, is regarded by the medical men, as well as the public, as almost omnipotent in the prevention and cure of hæmoptysis and consumption. With regard to my own limited experience, I may state that among the seventeen cases whose histories I shall give below, and the fourteen others who are still under observation, only one had slight hæmoptysis while residing on a high level, and that among these thirty-one cases, there are twelve who had from one to four serious attacks while residing in low elevations. These figures are too small to be regarded as decisive by themselves, but they may yet be useful as a contribution to others. They are not intended to show that hæmorrhage cannot occur in elevated regions to consumptive people, for it may, and does take place, but much less frequently, I believe.[2]

In a paper already mentioned it has been said, "One of the most frequent causes of pulmonary hæmorrhage is probably the rapid breaking down of lung tissue, and through this the lesion of blood-vessels before they have been oblite-

[1] "Climate of the Swiss Alps and Peruvian Andes compared," 'Dublin Quarterly Journal of Medical Science,' May, 1866.

[2] From repeated conversations with the late Dr. Archibald Smith, I can further state that the tendency to every kind of hæmorrhage, not only bronchial or pulmonic, appears to become diminished by prolonged residence on mountains. In aneurism, too, he found rather less disposition to bursting on higher elevations, and he has mentioned to me two cases which at last terminated fatally from rupture at Lima, while during repeated long stays in the mountains they felt very well and could undergo, without inconvenience, a certain amount of exertion. An analogous case has occurred in my own experience.

rated; and circumstances favouring such a process, are likely to increase the tendency to pulmonary hæmorrhage, while those unfavorable to it diminish the tendency, and I trust that such an influence may sooner or later be accorded to well-selected alpine climates."

Further experience has not changed my view in this respect—1stly, that there is in elevated climates a greater tendency to the absorption and cicatrisation of the products of chronic pneumonia; and 2ndly, that there is much less risk of the fresh occurrence of that class of inflammations which by some have been termed scrofulous, by others catarrhal and lobular pneumonia, and which often lead to the effusion of albuminous substances, giving the appearance of the so-called tubercular infiltrations, with a tendency to softening and formation of cavities. Another source of hæmoptysis, arising from catarrhal affections of the small bronchi, is likewise rarer on high elevations than in lower regions, because these catarrhal affections occur much more rarely on the former and have not the same tendency to spread to the smallest bronchi and the pulmonary tissue. One of the most prominent features, indeed, is that those who, at their usual places of residence, are very frequently troubled with "colds," *i. e.*, with catarrhal affections, commencing either as coryza, or as "sore throat," and thence extending to the bronchi, remain almost free from these affections during their prolonged stay in elevated regions. This leads me to another point.

I have often been told, "a great objection to the alpine plan is that your invalids, on account of the very low temperature, are obliged to stay at home on many days, or if they do go out, they contract pleuritis, pneumonia, and other febrile affections." The answer to the first part of the objection is, that the invalids do go out almost every day in spite of the deepest snow, and of a very low temperature. The heat in the sun during the midday hours is very considerable, and the delicate invalid is able to sit on the balcony, to walk and to drive in a sledge, even on the coldest days. Only just now Dr. Berry, of St. Moritz, wrote to me that a very deli-

cate young lady who had been sent to St. Moritz conjointly by Dr. Gull and myself, on account of pneumonic deposits in both apices, enjoyed without any ill-effects, a drive from St. Moritz to Silvaplana and back (about three miles) in an open sledge, on the forenoon of the 23rd of January, when the temperature at 7 a.m. was 13° Fahr. below 0 (—25° C.).

With regard to the second part of the objection, it is for obvious reasons very difficult to give a decisive reply. I have stated already that the invalids are much more exempt from catarrhal affections than at home, "but how does the comparison stand," I am asked, "with regard to the so-called southern health resorts?" My opinion is again favorable to the mountains. It would be unreasonable to compare the thirty-one cases sent to high-level with thirty-one others sent to low-level health resorts (the Riviera, Rome, Naples, Palermo, Egypt, Algiers), but amongst the seventeen cases whose histories I give, there are ten who have spent one or several seasons in southern health resorts. All these ten said that they had been much more free from intercurrent acute affections on the high-level, than on the low-level, places, but only of five can I give more accurate data. These five cases spent an aggregate time of about 80 months in low-level, and almost 160 in high-level, health resorts; of these 80 months they were confined nearly 20 months, or $\frac{1}{4}$th of the whole time, to their rooms or beds, on account of intercurrent diseases, especially bronchitis, pneumonia, pleuritis, rheumatic fever, and hæmoptysis; while of the 160 months on high ground they were confined for the same reason less than 10 months, therefore not quite $\frac{1}{16}$th of the time. Here again, however, I must allow that my experience is too limited to permit of a decided inference.

Possibly two of the assisting accessory causes for the rarer occurrence of acute affections during the stay in elevated places are—1stly, that the invalids, especially during the cold winter, take greater care of themselves, being reminded by the snow and ice around them, that it is not the true season for light clothing, even if the heat of the sun is great, while in the lower and warmer health resorts invalids frequently think

they can do with a single coat, become heated by a long walk in the sun, and chilled by return into comparatively cold houses or shady streets, &c.; and 2ndly, that the social conditions in high regions offer less temptation; there are none of the friendly parties, especially evening parties, which delicate persons when they *feel* well, like so much to join. The isolation in the not much frequented mountain regions, is less agreeable to the taste of most people, but it possesses, notwithstanding, its own advantages.

As it is my earnest desire that the whole question should receive the impartial attention of the profession, I will give the outlines of all the cases which have been at one time or other under my own observation, and of which I have further reliable information.

Case 1.[1]—*Summary.*—Chronic catarrhal pneumonia; deposits in right apex and left lower lobe; night perspirations; great emaciation (subacute phthisis); arrest of symptoms, and cure by stay in the Black Forest; fresh outbreak and death from hæmoptysis after return into unfavorable circumstances.

J. H—, æt. 24, a clockmaker from the Black Forest, came to London in good health in 1848. From that time he had frequent attacks of sore throat and cough, and became a patient of the German Hospital in the summer of 1851, with dyspeptic symptoms, cough, slight dulness, and deficient respiration in the supra- and infra-clavicular region. Was better and worse, but gradually lost weight up to September 1852, when he was seized with broncho-pneumonia of the lower part of the left side, gradually creeping upwards, until in the beginning of November, the dulness reached on the back the upper third of the scapula, the crepitant rhonchus having ceased in the lower part of the dull space, but being persis-

[1] This and the four following cases have, in substance, been communicated in the 'British Medical Journal' in 1867, their further progress, as far as it is known, is added. They are again mentioned in order that the material from which the conclusions in this paper are drawn may be at hand, and that others may form their own inference.

tent in the upper. On the right, the originally diseased side, the dulness extended from the apex to the fourth rib, and was accompanied by bronchophony and abundant rhonchi. There was much purulent expectoration, great emaciation, pyrexia every evening (102° to 103°), usually followed by profuse perspiration towards the morning. Pulse 110 to 120, and chest expansion 33 to 34 $\frac{1}{4}$ inches. In this condition he preferred returning to his mountain home in the Black Forest, about 2800 feet above sea-level. Here, living principally on milk, he soon lost the night perspiration, gained strength and flesh, and the cough and expectoration gradually became less, and had disappeared entirely when, to my astonishment, he presented himself to me in London, in July 1853. He had the appearance of a healthy man, there was nothing abnormal to be discovered on the left side, the upper part of the right was flattened, but the dulness extended only to the second intercostal space, and instead of bronchophony and rhonchi, there was only an absence of vesicular breathing, and a protracted rough expiration, without any rhonchi. Pulse 82, chest expansion 34$\frac{1}{2}$ to 36$\frac{3}{4}$ inches; increase in weight 21 pounds. He resumed his occupation in a narrow street of Soho, and considered himself well up to the beginning of August, 1854. He then began to cough, but continued to work for some weeks, when he was suddenly seized with violent hæmoptysis, and died on the fifth day after its commencement.

Post-mortem examination.—The upper lobe of the right lung was adherent, the apex hard, contracted, consisting entirely of slate-coloured, dense, fibrous tissue, almost grating under the knife. The lower part of the same lobe was emphysematous. The two other lobes were free from old disease, but congested, containing some fresh apoplectic nodules, and several bronchi were plugged up with coagulated blood. The left lung was everywhere adherent. In the centre of the upper lobe was a small newly-formed cavity, with irregular walls, unprovided with epithelial lining; the cavity was filled with coagulated blood, and surrounded by grey, soft infiltration, taking up a considerable portion of the

lobe. In various parts of both lobes were fresh apoplectic nodules, and some bronchi were filled with coagulated decomposing blood. The posterior and inferior parts of the lower lobe, the seat of the pneumonic affection in 1853, contained much more black pigment than the remainder of the same lobe, and were slightly more dense, but they were everywhere permeable to air. The heart was fatty, the liver likewise fatty (nutmeg); the kidneys were congested.

Case 2.—*Summary.*—Chronic catarrhal pneumonia; deposits in right apex, and left lower lobe; rapid emaciation (subacute phthisis). Arrest of symptoms during stay in Switzerland; temporary cure; fresh outbreak two years after return into unfavorable circumstances; rapid death from hæmoptysis.

J. K—, æt. 22, a native of Switzerland (the Oberalp), formerly healthy, came to London in 1849, and was employed as a waiter in a city dining-room. He began to cough in 1850, and had hæmoptysis in February, 1852. Dulness and rhonchi extended from the right apex to the third rib. There was increase of cough and pyrexia in July. Pneumonic affection of the lower part of the left side was discovered in August. The dulness and crepitant rhonchi had ascended to the supraspinal region on the left side in November, and the older affection of the right side had much extended. The patient was never entirely free from fever, and had profuse perspirations once or twice daily. Loss of weight, 30 pounds in eight months; pulse 90 to 95; respirations 30 to 36; expansion of chest 34⅓ to 35½ inches. In this condition he returned home (in November) to an elevation of about 5000 feet, and there on an almost pure milk-diet he gradually improved, and came back to London in May, 1853, having gained 24 pounds.

The left side appeared normal, the upper part of the right was sunk in, but there were no rhonchi, and the dulness and defective breathing extended only to the second rib. Pulse 76; respirations 14; expansion of chest 35 to 37½ inches.

He remained well until March, 1855, when he contracted

bronchitis, followed by pleuropneumonia of the right side, beginning at the apex, and extending rapidly downwards.

In June the upper part of the left side became likewise affected. Death ensued at the end of this month from hæmoptysis.

Post-mortem examination.—There were extensive adhesions on both sides. The upper lobe of the right lung was much contracted and puckered; the apex was occupied by several chalky concretions, surrounded by dense, fibrous, slate-coloured, airless tissue. The remainder of the right lung was in a state of soft grey infiltration, with several fresh irregular cavities. The apex of the left lung was in a similar condition, but the greater part of this lung was permeable to air; it contained many hæmorrhagic spots. There were no miliary tubercles. The heart was fatty. The kidneys were in the first stage of Bright's disease.

Case 3.—*Summary.* — Chronic phthisis, with hæmoptysis; temporary improvement during winter at Cairo and at Cannes and Nice; gradual progress of disease; arrest of symptoms on the Peruvian Andes; relapse at New Orleans; temporary cure on the plateau of Mexico. Fresh affection after six years, again arrested by a stay in the vale of Jauja.

H. F—, æt. 31, a German, came to London in 1852, had a chronic cough in 1853, and hæmoptysis in the summers of 1854 and 1856. He spent then seven months in Cairo, where he became better, without, however, entirely losing his cough. He had again hæmoptysis in March, 1857, in Cairo, and much cough during the summer of 1857 in London.

There was improvement during the following winter spent at Cannes and Nice, but he was much worse after his return to London. He was first seen by myself in July, 1858. He had lost 29 lb. in three years. There was dulness on the left side from the apex to the fifth rib, with bronchophony, and crackling rhonchus in the supra- and infra-clavicular spaces, and an analogous condition on the back of the same side. Nothing abnormal was discovered on the right side. Pulse 85; thoracic expansion 35 to 36½ inches.

He went to Valparaiso, and had there again hæmoptysis. He spent then eight months on the Peruvian Andes, at an elevation of between 9000 and 10,000 feet, gained flesh and lost the cough entirely. He went afterwards to New Orleans, where he again began to cough and lose flesh. He was sent thence to the tableland of Mexico, where, to his own feeling, he entirely recovered his health. When seen by me in the autumn of 1860, the dulness on the left side reached only from the apex to the third rib. This portion was much flattened, and there was absence of vesicular breathing, but no bronchophony and no rhonchus. He had gained 24 pounds in twenty-seven months. Pulse 66; expansion of chest 36 to 38 inches. He remained well until the spring of 1866, when he again began to cough, was often feverish, lost much flesh, and had some hæmoptysis. When seen in the beginning of October, 1866, the old affection of the left side had remained almost unchanged, but on the right there was dulness from the apex to the fourth rib, with bronchophony, and occasional crackling rhonchus in the subclavicular space. He had lost 20 pounds in twelve months. Pulse 95; chest expansion 35½ to 37 inches. He went to the valley of Jauja in the Peruvian Andes, and lost his cough almost entirely; and when seen in August, 1867, he had gained 15 pounds. The dulness descended on the right side only to the second rib. There was no rhonchus, but scarcely any respiratory murmur over the dull space. Pulse 74; expansion of chest 36 to 38 inches.

In December, 1868, when I saw him last, he felt quite well, the local phenomena being nearly the same. He had spent the intermediate time in several healthy parts of Germany and Switzerland, and had been able to climb considerable mountains without any ill effects.

Case 4.—*Summary.*—Early chronic phthisis, progressing in spite of a winter at Bordeaux and Cannes; arrest of symptoms, and cure in Switzerland.

B. D., from the lower parts of Switzerland, came to London in 1864, æt. 22. He was much depressed by the

fogs and dulness of the atmosphere. He had repeated attacks of bronchitis during the winter, and in the spring of 1865 he coughed, and became emaciated during the summer. There was slight dulness in the left clavicular, and infra-clavicular region, with diminished respiratory sounds. He spent the winter at Bordeaux, and at Cannes; he never lost his cough entirely, and continued to lose weight. He returned to London in May, 1866. The dulness extended on the left side from the apex to the third rib. He had, early in June, an attack of sore-throat, which was with him, the usual forerunner of bronchitis; he became feverish, and by the end of the month a pleuro-pneumonic affection was discovered in the lower part of the right side, which gradually crept upwards to the upper third of the scapula. By the end of July, the pyrexia had almost ceased under a treatment of milk, quinine, and cod-liver oil; but the dulness over the back of the right side had not yielded. There was crepitant rhonchus over the upper part of the dull space, and absence of respiratory murmur over the lower; pulse 92 to 100; expansion of chest 31¾ to 33 inches. The dyspnœa was great at every exertion, frequent cough, with about two and a half ounces of muco-purulent expectoration. Generally profuse perspiration towards the morning. He had lost 27 lb. in as many months' stay in London. In this state he went, towards the end of July, to the Righi; lived there almost entirely in the open air, and drank about two quarts of milk every day. In less than six weeks he was able to take considerable walks, and in October he had lost his cough almost entirely. He spent the winter in different parts of Switzerland, usually above 2500 feet above the sea-level. He had not a single attack of sore-throat and bronchitis, and when he returned to London, towards the end of May, the right side was quite normal; the left side was in front, in the supra- and infra-clavicular spaces, slightly sunk in; there was moderate dulness, and scarcely perceptible breathing from the apex to the second rib. He had gained nineteen pounds in weight during ten months, and felt in every respect perfectly well.

He was in excellent health in November, 1868, when I saw him last, and had almost remained free from cold while spending the preceding fifteen months in mercantile occupations at Malaga.

CASE 5.—*Summary*.—Subacute catarrhal pneumonia, with fresh deposit in the lower part of the left, and old in the apex of the right, lung. Recovery; and absorption of the fresh deposit during a winter at Davos.

B. K., æt. 21, had pneumonia of the right side about ten years ago. He came to London in spring, 1865, and began to cough and lose flesh in the winter, 1865-66. Hoarseness supervened in spring, 1866, and the cough gradually increased. When seen in July he was thin and pale, with circumscribed red cheeks; he had chronic swelling of the tarsal portion of the eyelids; pulse 105 to 110; respiration 26 to 30; temperature every evening slightly increased. There was fresh pneumonic affection of the lower part of the left side; dulness and absence of respiratory murmur on the right, from the apex to the third rib. The evening pyrexia gradually subsided, under perfect rest and milk diet, but the pneumonic affection slowly crept upwards; the dulness extending on the posterior part of the left side, from the bottom to the upper third. When he left England, towards the end of August, there was crepitation with slight bronchophony over the greater part of the left scapula, and the older affection of the right side had remained unchanged. He was advised to go to the Davos, but went first to Germany, and only after having been attacked by fresh colds he repaired in November to Davos am Platz, where he stayed until the middle of April, and in spite of a rather unfavorable winter, entirely lost his cough, and gained seven pounds in weight, the spirometer showing an increase of pulmonary capacity amounting to more than 900 cubic centimétres. According to Dr. Unger's report at the time of B. K—'s departure from the Davos, nothing abnormal could be discovered on the left side, except, perhaps, slight dulness in the lower part; and the dull space on the upper portion

of the right side was likewise diminished. In addition, the affection of the eyelids, which had existed for several years, had entirely disappeared without remedial interference. When I last heard of this gentleman, at the beginning of the winter of 1867, he had remained quite well.

CASE 6. — *Summary.* — Chronic phthisis progressing in spite of three winters in southern health resorts. Advanced affection in both lungs. Twice temporarily much improved by a stay on the Cordilleras; fresh attacks of hæmoptysis on return to the coast; at last entire cure by three years' residence on the Cordilleras.

C. A—, æt. 24, a member of a scrofulous and consumptive family, commenced to suffer from frequent coughs in 1849, at the age of 21; spent the winter of 1849 to 1850 at Nice, where he had an attack of pleuritis with effusion, by which he was laid up for three months, and was much reduced, but recovered strength and flesh during the summer of 1850, which he spent principally at Appenzell and Engelberg, in Switzerland. During the winter of 1850 to 1851 he was at Cairo, where he had a serious attack of hæmoptysis, but was on the whole much better than in the previous winter. The summer of 1851 was again occupied by a whey cure in Switzerland, and a long stay at Interlaken, which latter place, however, had not so good an effect as Engelberg in the preceding year. A second winter at Cairo, from 1851 to 1852, was again attended with an attack of hæmoptysis, by which he was kept in bed for five weeks. He returned to Switzerland in June, 1852, with a troublesome cough, much expectoration, and profuse perspirations; was again much improved by a prolonged stay at Appenzell, but was not free from cough, when, in September, 1852, he came to London on his way to Valparaiso, where he was to settle in business. He was pale and thin, with a long neck, had dulness of percussion, bronchophony, and gurgling from the apex to the fourth rib, in front of the right side, and likewise dulness and bronchophony in the right as well as left supra-spinal region; there were mucous rhonchi, without

dulness, and bronchophony in the left infra-clavicular region, and there was evidence of retraction of the lower lobe of the left lung, where the pleuritic effusion had occurred not quite three years before. The pulse was between 90 and 100; the appetite was uncertain, and he had occasional attacks of diarrhœa. To Dr. Archibald Smith I am indebted for the account of the progress of this case. He arrived at Valparaiso rather strengthened by the voyage; spent the first three months in tolerable health, but then had again two attacks of hæmoptysis in rapid succession; was advised to try Lima, where he saw Dr. A. Smith, who at once dissuaded him from remaining, and sent him to the valley of Jauja, 10,000 feet above sea-level. There he lost the perspiration and cough, and improved so much, that he considered himself cured after about eight months, and returned to Lima. He was well for about three months, after which he began again to suffer from indigestion and from cough, and had another attack of hæmoptysis; he was easily induced once more to take refuge in the Cordilleras, and in less than four months lost every feeling of illness, and after four months more, went to settle at Tacna, but only to have, after about five months, a return of all the old troubles,—indigestion, cough, nocturnal perspiration, hæmoptysis. He, at first, was disinclined to give up his work, but at last, having become very weak, and unable to make the slightest exertion, he accepted the doctor's advice to live for three entire years on high ground; he spent those years principally in the Peruvian Andes, but part of the time also at Quito, and another part in different places of Bolivia. He felt quite well after about three months' stay on the mountains, and had scarcely a day's illness during the remainder of the three years; he had some mucous expectoration in the morning, but no real cough. After this, he spent several years in business at various places on the west coast of America, and returned to Europe in the autumn of 1867, when I had the opportunity of examining him. He was well nourished, almost stout, and had a healthy appearance; pulse 70; digestive functions good. The upper part of the chest, on

both sides, flattened, more so on the right, where there was dulness from the apex to the third rib, scarcely any respiratory sound, with occasional distant mucous crackling, while in the lower parts of the same side, the respiration was quite normal, the lung having expanded below to the margin of the false ribs; the clavicular and supra-clavicular region of the left side was likewise dull, with absence of respiratory murmur, but from the first intercostal space downwards, the phenomena were normal as far as the sixth rib, where the intestinal sound commenced; the heart was entirely on the left side.

Case 7.—*Summary.*—Subacute phthisis, originated near the coast of Peru, only slightly checked by a stay at Huanuco, (7000 feet elevation), but more energetically by a residence at Jauja (10,000 to 11,000 feet) in the Peruvian Andes. Fresh hæmoptysis three years later at Lima, and almost entire cure by a second prolonged stay on the Cordilleras.

K. S—, a native of Germany, belonging to a family not free from scrofulosis and consumption, had been residing for several years at Tacna and Lima, when at the age of twenty-five he began, according to Dr. Archibald Smith's account, to suffer from dyspepsia and cough, and had severe hæmoptysis in 1859. Dr. A. Smith found dulness, bronchophony, and crackling over the upper part of the right side, as well in front as in the back, and sent him to the Cordilleras. He first went by his own choice to the vale of Huanuco (elevated about 7000 feet), which he described almost as a Paradise, but after four months he had made no sensible progress, when Dr. A. Smith advised him to go to Jauja (10,000 to 11,000 feet above the sea), where he rapidly improved, and entirely lost his cough and every feeling of illness. He returned to the coast after ten months' stay in the Cordilleras, and was well during more than three years; but then, under the influence of over-work and anxiety, he again began to cough and had another attack of hæmoptysis. Of his own accord he sought refuge in the Cordilleras, travelling about during eighteen months in different parts of Peru, Bolivia, New

Granada, and Ecuador, almost always at an elevation of more than 8000 feet above sea-level. He was afterwards engaged in business in several places on the west coast of South America, enjoying good health, and returned to Europe in 1866, when I had the opportunity of examining him, and found only flattening of the upper part of the right side of the chest, with dulness of percussion, extending from the apex to the second rib, and occasional mucous rhonchus on deep inspiration; the upper part of the left side was likewise slightly flattened, and the supra-clavicular space sunken in; there was no cough, the general health was perfect, and the nutrition of the body good. He has since resided in various parts of Germany and Switzerland, without any disturbance of health.

Case 8.—*Summary.*—Hæmoptysis and subacute phthisis, originating at Rio and Panama; temporarily checked by a stay at Quito; return of disease at Lima; entire arrest and cure by a longer stay on the Cordilleras; absorption of the fresh deposit; cicatrisation of the old affection.

D. H—, a native of Switzerland, had enjoyed good health up to his 26th year, when he went to Rio, where, after two years' residence, he had hæmoptysis, from which he slowly recovered; he went then by sea round the Cape to Panama, where he settled, but was soon again attacked by cough and hæmoptysis, which were followed by nocturnal perspirations, and great emaciation; he was then recommended to go to Quito, where he soon improved so much that he went to Lima; here, however, within less than a year, he was again taken ill with dyspepsia, cough, and hæmoptysis, and was much reduced. Dr. Archibald Smith found the upper part of the right, and the lower part of the left, lung extensively affected, the former old, the latter more recent, and sent the patient to Jauja where he lost his cough and regained strength; he resided during two years in different parts of the Cordilleras, and then went to New York. In the autumn of 1867, I had the opportunity of examining him, and found no trace of disease in the left lung, while there was flattening at the upper part of the right side, with dulness of percussion in

the supra- and infra-clavicular space, and absence of vesicular breathing. The nutrition and general health were quite satisfactory. He had no cough, and the spirometer gave 215 cubic inches, the height of the man being five feet seven inches. Towards the end of 1868, I saw D. H— again, on his way to Buenos Ayres; he had continued in good health.

Case 9.—*Summary.*—Subacute phthisis, occurring during residence at Lima; arrest of disease by stay on the Cordilleras; relapse some time after return to the coast. Permanent cure by a second and longer stay on the Cordilleras.

C. H—, a native of Scotland, went to Lima at the age of 24, in good health; after about one year's residence in 1858 or 1859, he lost strength, had dyspeptic symptoms, began to cough, and perspire at night; when this had lasted about two months, Dr. A. Smith found dulness, bronchophony, and crackling respiration at the upper part of the right side, as well in front as in the back, and the same signs, to a less degree, over the apex of the left lung; the patient had entirely lost his appetite, was much emaciated and feverish. As he did not improve under treatment, after four weeks, he was sent to Jauja, where he improved rapidly, and returned after eight months to Lima. There he had in 1861 a return of the same symptoms as before; he went again to the Cordilleras, where he regained his health, and after about a year he settled for some time in Guatemala (about 4500 feet above sea-level), and there continued well. Since then he has resided in various places of South America, and also at the coast, without having a return of the chest affection. When I saw him in January 1868, I ascertained considerable flattening of both infra-clavicular regions, which were sunken in and manifested dulness on percussion, extending on the right side to the second rib, and on the left only to the first intercostal space; there was no vesicular breathing over the dull space, and slight bronchial breathing over the right supra-spinal region. His nutrition and general health were good. The

spirometer gave 235 cubic inches, the height being five feet nine and a half inches.

CASE 10.—*Summary.*—Chronic phthisis, only temporarily and slightly benefited by a winter at Cairo, and one at Algiers, but permanently arrested by a prolonged stay on the Cordilleras.

L. N—, a native of Belgium, having lost both parents and three brothers from consumption, began to cough after two years' residence in London; in the summer of 1859, had slight hæmoptysis; in the autumn of the same year, had dulness of percussion, and mucous rhonchi in the right clavicular and super-clavicular region, lost flesh, and had slight pyrexia towards night; he spent the winter at Cairo, and was tolerably well up to February, when he had bronchitis, and a more severe attack of hæmoptysis, by which he was confined almost two months. He went from Cairo first to Eaux Bonnes, where he gained much strength; on his return to London in June 1860, was found to have slight dulness in the left clavicular and sub-clavicular region, but he had almost lost the cough, and was better in general health; in September he began again to cough, and went to Algiers, where at first he likewise improved much, but had again bronchitis in January and February, by which he was much reduced. After having spent the months of April and May, and part of June at Arcachon and Eaux Bonnes he returned to London, much improved in strength, but with increase of local affection on the right side. In August 1861 he began again to cough, and had much purulent expectoration. He then made up his mind to settle at Valparaiso, but already in 1862 he there had again a severe attack of hæmoptysis, after which he was sent to the Cordilleras. He first went to Huanuco, but not improving sufficiently he proceeded to Jauja, where he lost his cough entirely; he then spent more than fifteen months in high elevations, and before returning to the coast he stayed several months at intermediate places (Guatemala and others). Since then he has remained quite well, and when I saw him last year, there was, beyond flattening at

the upper part of both sides, and diminished vesicular breathing, no trace of his former affection to be discovered. The spirometer gave 210 cubic inches, his height being 5 feet seven inches.

Case 11.—*Summary.*—Chronic phthisis, occurring in the low parts of Switzerland, only slightly improved by two winters at Nice and Algiers; greatly improved by a prolonged stay in the Cordilleras.

In August 1863, I saw, with the late Professor Griesinger, at Zurich, a gentleman, æt. 25, a native of Bâle, who had been suffering from cough and various attacks of bronchitis and pneumonia since 1860, and had spent on Griesinger's advice one winter at Nice, and another in Egypt, had had several inflammatory attacks at these places, but had been better while there than at home. There was dulness of percussion, with bronchial respiration, and moist rhonchi on the left side from the apex to the fourth rib, and also in the supraspinal region of the same side; he had lost ten pounds of weight during the summer, had a rapid pulse (90 to 95), and frequently perspired at night. We both urged him to spend the following winter at Davos, but he decided, on account of occupation, on going to Buenos Ayres, where, after an attack of hæmoptysis, he was advised to go to the Cordilleras of Peru. After eleven months' stay on high ground he felt quite well, and when, on his return to Europe he saw Griesinger in 1866, the Professor found him "much improved, far beyond his expectation, free from cough" and "almost fat," but the promised details of the condition of the chest I have not received.

Case 12.—*Summary.*—Chronic catarrh, hæmoptysis, subacute phthisis; great improvement by prolonged stay on the plateau of Mexico. Death from hæmoptysis at a later period in Spain.

H. S—, a German, æt. 22, of a consumptive family, suffered much from sore-throat and cough, while residing in London in 1858 and 1859. There were, however, no phy-

sical changes in the lungs discovered. I advised him to seek occupation in a brighter air, and proposed the Cape of Good Hope and Buenos Ayres; he spent a year at each place, being much better, but seldom quite free from cough; he afterwards found a favorable situation at Vera Cruz, where, however, he was seized with severe cough and hæmoptysis, and was sent to the plateau of Mexico and Puebla. On his arrival at Mexico almost the whole of the right lung was declared to be destroyed, but within eight months he had lost the cough and could climb high hills without ill-effects. The disturbed state of the country induced him to leave, and I saw him in June 1864, when he had been free from cough for more than a year. There was dulness of the upper part of the right side down to the third rib, and occasional rhonchi and slight bronchophony in the same locality; the general health and nutrition good. He considered it unnecessary to follow my advice with regard to a return to high elevations, and in 1865, while travelling in Spain, H. S— was seized, while apparently quite well, with hæmoptysis, and died there after a short illness. There was no post-mortem examination.

Case 13.—*Summary.*—Chronic phthisis, improved by a stay in subalpine places of Switzerland; fresh outbreak of acute nature at Panama, arrest by stay on the Cordilleras; renewed attack a year after return to Panama, with rapidly fatal termination.

In 1859 I saw B. D—, æt. 27, who had had several attacks of bronchitis in 1855 and 1856, and one of pneumonia in the spring of 1857; after a stay of five months in Appenzell and Engelberg, in Switzerland, he was much improved, and had remained almost free from cough. When I saw him, there was slight flattening and dulness on the upper part of the left side, but otherwise no morbid symptom. He was then on his way to Central America and settled at Panama in spite of an adverse opinion; in 1861, however, he had prolonged bronchial attacks, "passing into phthisis;" he was sent to the Cordilleras, where he soon improved, and after six months entirely lost his cough. He then returned to

Panama, "was at first quite well," but was again taken ill after a year, and died from "galloping consumption."[1]

CASE 14.—*Summary.*—Early phthisis, with repeated attacks of hæmoptysis occurring in London and Hastings; cure by prolonged stay in the Upper Engadine.

A. E. S—, native of England, æt. 21, had in his ninth year, at Genoa, pleuritis with effusion, was afterwards affected with glandular abscesses on the neck; enjoyed tolerable health, with the exception of frequent epistaxis, from the eleventh year. In May 1865, when nineteen and a half years old, he had, while residing in London, hæmoptysis, followed by cough, from which latter he was not yet free, when he had a second severe attack of hæmoptysis at Hastings; a third and slighter attack occurred seven months later. In May 1866, he consulted Dr. Gull, who found the upper part of the right side of the chest flattened, with dulness of percussion, bronchial respiration, and moist rhonchi, and the same phenomena in the right supra-spinal region. The pulse was rapid, the digestion and nutrition of the body unsatisfactory. Dr. Gull regarded the case as one of "early phthisis," prescribed cod-liver oil, nitric acid with cascarilla, and advised a prolonged residence in the Upper Engadine. When A. E. S— arrived at Silvaplana in the Upper Engadine in July 1866, Dr. Berry, of St. Moritz, found besides the condition described by Dr. Gull, also defective respiration in the left apex; cough not very troublesome, expectoration scanty, greenish; pulse 85, respiration 38. The patient improved already in the summer, but the most marked progress occurred during the following winter, after his removal from Silvaplana to St. Moritz. The cough, expectoration and breathlessness disappeared; the appetite, digestion, nutrition, and strength increased. In February, 1867, he had gained 7 lb.; pulse 72 to 74; respiration 19; the dulness of percussion, bronchial respiration and rhonchi had disappeared. In September 1867, when I examined A. E. S— at

[1] The words between the inverted commas are from the report of the medical attendant.

St. Moritz, the breathing over the whole of the left side was perfect; on the right side, the upper part of which was slightly flattened, there was no marked dulness, but the breathing was rougher from the apex to the fourth rib, and the expiration prolonged from the second to the fourth rib. Pulse 64 to 68; respiration 16 to 17. Nutrition and general health satisfactory. He was able to walk three hours without inconvenience. He has remained at St. Moritz up to this by his own choice, and has not had any illness. In September 1868, when I again examined him, the roughness of respiration on the upper part of the right side was much less marked.

I am indebted to Dr. Gull for the early history of this case.

Case 15.—*Summary.*—Chronic catarrhal pneumonia in a delicate lady, repeatedly improved by residence in elevated regions, but not perfectly cured.

P. S—, a native of Livonia, married, and came to London in 1859; the family history of phthisis, the very delicate appearance, and the continued want of appetite, caused anxiety from the beginning. Had in rapid succession several confinements and miscarriages, was rarely free from leucorrhœa, suffered frequently from cough, had in the winter 1862 to 1863 severe catarrhal pneumonia, affecting the greater part of the right lung, and leaving imperfect breathing and slight dulness in the affected parts; great improvement during the summer of 1863, from prolonged stay at Görbersdorf, in Silesia, and in various parts of Switzerland; she was, however, rarely free from cough after this period. She gained much strength by spending the summer of 1866 at Davos am Platz, where she was almost free from cough; but under the influence of another confinement, great mental depression, the loss of a child, exposure to cold, and a low and damp residence, catarrhal pneumonia became again developed early in 1867, and this time principally in the left lung. When I saw her in April and again in May of that year, with Mr. Fox, of Stoke Newington, there was dulness with almost bronchial

respiration, and occasional rhonchi from the apex of the left side to the fourth rib in front, and in the supraspinal region on the back; the respiration in the right apex, and in the lower part of the right side, as well in front as on the back very indistinct, with slight dulness. Frequent hacking cough, with scanty sputa, occasionally tinged with blood; pulse feeble, usually between 105 and 115, when at rest; respiration 24 to 28; temperature between 99° and 101°5 Fahr.; great emaciation. Cod-liver oil, quinine, and morphia, and the application of stimulating liniments were advised, and a long stay at Davos, whither she went towards the end of May, 1867. There she gained strength, and when I saw her in September with Dr. Unger, to whom I am indebted for a careful report of this as well as the following case, and also Case 5, she had almost lost the cough, and was able to take a moderate amount of exercise. The dulness of percussion on the left side had disappeared; there was only a rough inspiration and prolonged expiration, the phenomena on the right side having remained unchanged; temperature still too high—98°6 to 100°5; pulse 82 to 86; respiration 20. During the winter 1867 to 1868 she was on the whole much better, and only in March, during the great thaw, she had influenza with increased bronchial affection, confining her to the house during several weeks. She left Davos for England in September, 1868. At my examination in November I found her less thin, the pulse stronger, 82 to 85, respiration 20; on the upper part of the left side inspiration still rough, but expiration less prolonged; phenomena on the right as before; cough very moderate. She has since then had several slight colds, and feels as if the air were too heavy for her, and is obliged to be much more careful than she used to be at Davos.[1]

Case 16.—*Summary.*—Long-continued anæmia in a delicate young lady, subacute catarrhal pneumonia; at first, great improvement at Davos, then, while there, fresh attacks

[1] The disease has remained perfectly quiescent up to this time, September, 1869.

of catarrhal pneumonia, not yet arrested at the time of departure.

M. W—, younger sister of the former, had suffered from anæmia and frequent cough for several years, and had never been pregnant when she came to Davos in June, 1867, where Dr. Unger ascertained dulness, feeble inspiration, and rough expiration from the right apex to the second rib, and also in the right supraspinal region. He found her very anæmic, but free from fever; pulse 72; cough and expectoration moderate.

In September of the same year, when I examined the patient, together with Dr. Unger, the morbid phenomena on the right side had almost disappeared, but moist rhonchi were heard over the apex of the left lung, and there was occasional pain in inspiration, in the posterior and inferior part of the left side, associated with mucous rhonchi, but without dulness of percussion. Cough slight, sputa scanty, mucous, mixed with much air; temperature 98°4 to 98°8; pulse 75 to 80; respiration 18. These morbid symptoms disappeared entirely, according to Dr. Unger's report, in the beginning of the winter, and she enjoyed good health up to the end of March, when, in the period of the melting of the snow, she was seized with influenza, which led to chronic catarrhal pneumonia, especially of the right lung; and she was not yet free from cough and pyrexia when she left Davos in August, 1868.

I ought not to omit stating that this patient, separated from her husband, was in constant anxiety and uncertainty from the beginning of March until the time of her departure from the Davos.

Case 17.—*Summary.* — Chronic catarrh; hæmoptysis; winter at Pau without material benefit; subacute catarrhal pneumonia; arrest of disease and absorption of the deposits during prolonged stay in elevated parts of Switzerland.

F. W—, a German, came to England in good health in 1861, æt. 22; had frequent colds since 1865; slight hæmoptysis in October, 1866, without any discoverable local alteration; spent the following winter and spring at Pau,

had, while there, two attacks of bronchitis; returned to London in May, 1867, considerably stronger, but had then slight dulness accompanied with mucous rhonchi from the apex to the third rib on the right side, and was not free from cough; had in July and August catarrhal pneumonia affecting principally the lower lobe of the left lung, with much purulent expectoration, dulness, feeble inspiration, subcrepitant rhonchi from the middle of the scapula downwards. Pulse 95 to 100; respiration 24 to 26; vital capacity of lungs 180 to 190 cubic inches (height 5 feet, 9 inches). Perspired profusely almost every night, and had still slight pyrexia every evening (100°0 to 100°5), when he left at the end of August for Badenweiler, on the Black Forest, where he recovered his appetite and gained strength; but he did not lose his cough and perspiration until he went to Engelberg, in Unterwalden, where, to his own feeling, he entirely regained his health before the end of October. He then spent the winter in different parts of Switzerland, usually over 3000 feet high, and the spring at the lakes of Como and Lugano. When he returned to London in June, 1868, he had gained 19 lbs. in weight, and 60 inches in spirometric capacity; pulse 68 to 72; respiration 14 to 15; temperature normal. He had no cough, and, excepting a certain roughness in the inspiration and a long expiration, there was no deviation from health in the previously affected localities. He remained well, with the exception of a slight bronchial catarrh, up to January, 1869, when he left for Buenos Ayres.

With regard to the *treatment* of this and the majority of the other cases during their stay at high elevations, I will only mention that it was almost entirely dietetic and hygienic. Milk as much as possible; meat—the supply of which is unfortunately sometimes defective—twice or three times daily; a moderate amount of wine; free ventilation of the rooms, which are to be situated on the sunny side, and not to be heated, if possible, above 60° Fahr.; regular exercise in the open air as long as there is no pyrexia. Some of the physicians practising on high elevations make regular use of

more or less powerful cold douches, and in many cases apparently with great advantage.[1]

These cases, though limited in number, will, I trust, offer to impartial judges some evidence in favour of mountain climates in certain forms of consumption. They are, as already stated, not selected, but they are all the cases with which I have come in personal professional contact, with the exception of those patients (fourteen) who are still under treatment, partly in Switzerland, partly on the Cordilleras, and the reports of whom, as far as they go, I may regard as very satisfactory.

Great importance I attribute to the four cases which, at a later period, terminated fatally. The first two occurred to me when I was not yet aware of the beneficial effect of elevated climates on consumption. They are curiously analogous. Young men in apparently good health, without hereditary predisposition, accustomed to pure mountain air, became lowered in general health under the influence of confinement and impure air; catarrhal affections developed themselves, leading gradually to catarrhal pneumonia, with the phenomena of subacute phthisis. In this condition they returned, of their own accord, to their mountain homes to die at least, as they both said, with their own families. The effect in both was cure for the time being; but too soon they again exposed themselves to the former unhealthy influences; at first apparently with impunity, but after some time they were attacked by fresh catarrhal inflammations, leading to grey infiltration, rapid breaking down of tissues, and the formation of small cavities; violent hæmoptysis accelerated the fatal termination. These two cases, therefore, as well as 12 and 13, convey the lesson that the return, at least the permanent return, into the circumstances under which the disease had arisen, ought to be postponed as long as possible. In the first two cases the

[1] Some of the patients, who were able to bear cod-liver oil, continued it during a great part of their stay in high elevations; some others also who could not bear it while in low situations were able to do so on high ground, but several patients who did well had neither any remedies nor any douches.

original affection had been truly cured, either by absorption or contraction, and the seats of the first affections were not again attacked by the fresh and fatal diseases. It may be said that they were cured of one attack of pneumonic phthisis, and that they died of a second attack. Cases 12 and 13 are impaired in their value by the absence of post-mortem examinations; but in these, too, the residence in elevated regions had, at all events, exercised a very beneficial influence, and would probably have led to permanent cure if it had been more prolonged.

Case 6 is perhaps still more instructive, by showing that occasionally, even in much advanced affections, elevated regions favour a curative process; the facts that the urgent symptoms twice entirely disappeared on the Cordilleras, and twice reappeared again after some stay near the coast, are very significant, and not less so the circumstance of a permanent cure after three entire years' residence on the mountains. It is also evident that, in this case, the influence of the warmer low-level health resorts was less favorable than that of the colder high-level localities. The same may be said of several other cases, especially Griesinger's (xi).

The two least favorable cases are 15 and 16, the only representatives of the fair sex, two sisters, of great delicacy, with an habitually bad appetite, the only offspring of a consumptive early deceased mother, and an asthmatic father.

Case 15, however, though not cured, may be regarded as having been greatly benefited by the mountain climate, the process having been, at all events, checked during more than eighteen months. The sister (16) had at first made satisfactory progress; the local deposit had been absorbed, the anæmia diminished, and the strength increased; but a little want of care, during the dangerous period of the general thaw, led to influenza and catarrhal pneumonia, which was not arrested during her stay at Davos. Although this was probably due, in a great degree, to most untoward influences acting on her mind, yet the case must be acknowledged as unfavorable.

I have taken up already so much time, that I can only, in a most cursory manner, allude to some other points which I should have liked to enter upon more fully. I will not venture on an explanation of the *modus operandi* of elevated places. The agents under which the invalid is placed are very complex. In a former communication I have used the words: "the air of elevated regions is lighter, more rarefied, and cooler, and it is usually free from the foreign admixtures found in towns, and also from the various kinds of malaria." It would be easy to mention several other attributes of the mountain air. If we only take the rarefication of the oxygen, viz., that a certain volume of air contains less oxygen than in low elevations, it at once gives rise to several questions which we are not yet prepared to answer. Is less oxygen inhaled, and the combustion retarded? or, does the diminished quantity of oxygen lead to increased respiratory movements? or, is there a greater "mobility of the atoms" in high elevations, "making atonement for the smallness of their number by the promptness of their action?" as seems to result from Frankland's[1] and Tyndall's[2] experiments on combustion on the top of Mont Blanc. Or, does the large amount of ozone increase the oxidizing power? Scientific experiments on tissue-change in man and animals, at high and at low elevations, are necessary for the settlement of these questions.

With regard to the "admixtures" to the air, Professor Tyndall has kindly directed my attention to the researches of Pasteur,[3] who has shown by experiments, that in plains, and at low elevations, the admixture of dust to the air is greater than at higher elevations, and further, that this "dust" contains not only inorganic, but also organic substances, leading to fermentation in fermentable fluids. He has found a total

[1] "On the Influence of Atmospheric Pressure upon some of the Phenomena of Combustion." By Dr. E. Frankland, F.R.S. 'Philos. Trans.,' 1861.

[2] 'Heat as a Mode of Motion.' By John Tyndall, F.R.S. 1863.

[3] "Mémoire sur les corpuscles organisés qui existent dans l'Atmosphère." Par M. L. Pasteur. 'Annales de chimie et de physique,' III Sér., vol. lxiv, 1862.

absence of the fermentation-producing constituents in the air of the Mer de Glace, near Chamounix, while the village of Chamounix was rich in them. This is, no doubt, a matter well deserving our most serious consideration, and is in harmony with the fact, that putrefaction does not so easily occur in high elevations, that meat can be dried by simple processes which could not prevent its decomposition in low elevations, and many other allied facts. The circumstance urged by Villemin,[1] that consumption is comparatively rare where the population is scanty, and that it increases in frequency as soon as the population becomes more dense, is likewise in accordance with Pasteur's experiments, and not less so the data given by Bowditch, Simon, and Buchanan in favour of the view that consumption becomes rarer by the drying up of the soil, for moisture favours the development of germs and putrescence, and especially the moisture emanating from the surface of soil charged with refuse of various kinds, and other organic matter.

The high mountain air contains less humidity and more ozone, than that of most lower regions. From observations made in the course of the present winter by Mr. Townsend, an experienced meteorologist, it appears that the quantity of ozone registered at St. Moritz, in the Upper Engadin, is very large. Whether the amount is as great during summer, is not yet known, but Dr. Berry has promised to continue the observations.

We must take also into consideration the effects of change of scene, food, occupation, the whole manner of living, and many other points, assisting in many, but counteracting in some, cases, the favorable influence of long residence in elevated regions. Many of the influences at work are not peculiar to elevated regions, but exist in the same, some even in a greater degree in others, especially maritime health resorts. I wish, altogether, by no means to be understood as if I were, under all circumstances, in favour of high-level, in opposition to low-level, health resorts. I only wish to

[1] 'Études sur la Tuberculose.' Par J. A. Villemin. 1868.

direct the attention of the profession to climatic agents, hitherto not generally appreciated in a great class of ailments, and morbid tendencies, in which our means of relief and cure are confessedly inadequate. Indeed, some of the best physicians, and even of those practising at southern climatic health resorts, would subscribe to the words of Dr. Gull, addressed to a delicate patient threatened with consumption, regarding whom I consulted him, "My experience with regard to the warmer health resorts is great, but it is unfortunately not favorable."

I venture to hope that the facts I have placed before the Society, assisted by the experience and opinion of medical men in other countries, will be deemed sufficient to induce to further and more extensive trial. I have scarcely a doubt that it would be an immense gain to the poor soldiers of the Indian army, threatened with consumption, if they were to be removed to the highest available mountain sanitaria of the Himalayas, instead of being invalided and sent home. It is, however, necessary to bear in mind that the elevation required is much greater in hot than in colder latitudes, and regard must be had to dryness of soil, and other local circumstances. It is possible that the military sanitaria, at present in existence, in the Himalayas, are not high enough for that climate, and that mountain range. It is further necessary to bear in mind that a few months, which is generally all that is given for the recruiting of health, is not sufficient in consumptive conditions; the apparently perfect cure after six or eight months, and the relapses repeatedly occurring in the cases which I have communicated, sufficiently show this.

With regard to places eligible for the English invalid, I wish I could mention many mountain health resorts of easy access, provided with good carriage roads, with comfortable hotels, excellent food, and genial society; but I will at once confess that these are things of the future. I do not know of any resorts in Europe equal to the valley of Jauja, in Peru, with regard to climate, or to the other towns of the Cordillera chain where some of the preceding cases have regained

their health; but it will be difficult for some time to come to induce most invalids from Europe to go so far. Even the journey to Mexico, the plateau of which, when once the country is settled, will offer excellent consumptive health resorts, will probably be considered by most people too great. In England there are not yet any inhabited places high enough to serve as mountain health resorts to the consumptive, but in all probability there are localities in the Welsh, Cumberland, and Scotch mountains which could be made eligible by drainage, and by the plantation of fir trees, as shelter from the sun in summer, and from the wind in other seasons. In Switzerland I have met with many suitable localities; but without well-arranged hotels, and skilful medical men, they cannot be recommended. The places which, at present, answer best, are the villages of St. Moritz (above 6000 feet) and Samaden (about 5500), in the Upper Engadine. Pontresina, Campher, Silvaplana and Maria, are likewise in favorable situations, especially for summer residences. The presence of several good carriage roads for sledges during winter is a great advantage in the Engadine. Similar advantages are enjoyed by the valley of Davos.[1] In Germany there exists at Görbersdorf, in Silesia, an institution for the cure of consumptive conditions, and the results obtained are, as far as I know, satisfactory. In the Bavarian Highlands we have Kreuth, which, however, is only open in summer. There are probably many other places in the different mountain chains of Germany which would be suitable as health resorts by their position if the other conditions were supplied. Küchenmeister (l. c., p. 53) particularly recommends *Königswart* in Bohemia, in the neighbourhood of the Spa Marienbad. Königswart is a chalybeate Spa, about 2200 feet above sea-level, lying on the southern slope of a wooded hill which is about 300 feet higher; it is at present only visited as a summer health resort, principally on account of its chalybeate springs, but the "Kurhaus" might easily be arranged for the reception of invalids during winter, and the fact that

[1] A description of the valley of Davos will be found in the 'Brit. Med. Journ.,' 1867, vol. ii, p. 58.

it is exposed to the south-east, south, and south-west is particularly advantageous. Dr. Cohen, an intelligent physician, who lives in the village of Königswart, has assured me that consumption is excessively rare in this village, although it lies several hundred feet below the Kurhaus, and in a less dry situation. .

A disadvantage of the Swiss, and of the German health resorts, is the unfavorable period of the general thaw in spring, when, especially in Switzerland, from the melting of the immense masses of snow the air becomes very damp, and the disposition to catarrhal affections is much greater than during the winter, as is seen from Cases 15 and 16. The commencement and termination of this period vary with the elevation; for the higher parts of Switzerland they may be said to extend from the middle of March to the middle of May. Those invalids who are able to travel, would do well to remove during this time to better localities; those who cannot travel must be particularly careful. It is, however, not easy to find suitable health resorts for this intermediate period, for spring is almost everywhere unfavorable. If it could be done, I should send the patients 2000 feet higher up, where the melting of the snow commences more than a month later, but this is impossible, for the simple reason that there is no accommodation so high up; it, therefore, is necessary to look for lower and warmer, not too distant localities, where this period is over when it begins in the higher regions; and here for the invalids wintering in the Engadine or Davos some places on the Italian lakes offer themselves, as Bellaggio, Menaggio, Cadenabbia on the lake of Como and also Lugano; for the western parts of Switzerland, Montreux on the lake of Geneva; for the most eastern portion of Switzerland and the Tyrol, Meran and Botzen; but none of these places answers our wishes, and delicate persons must be much more careful with regard to dress and exposure in those warmer localities than they were during the cold season in the mountains. All the invalids whom I have questioned on this subject agree on this point, and almost all of them are also in harmony in stating that the long cold *winter*, and not

the summer, is the most favorable time for them on the elevated health resorts, that they feel themselves better, are more free from cough and cold, and make greater progress during winter than during summer.[1] I must lay particular stress on this statement, because, in general, medical men, as well as the public, are inclined to admit the suitability of high alpine slopes and valleys during summer, but are afraid of the cold winter, which in reality seems to be the better season for most consumptive invalids.

As this communication has become longer than I had intended, I venture to sum up the principal points:

1. That the elevated regions deserve greater attention in the management of consumptive tendencies and affections, than they have hitherto received.

2. That they deserve this attention not only as summer, but also, and even more so, as winter health resorts.

3. That they offer great advantages in many cases of early consumption, or of tendency to consumption; in the disposition to catarrhal pneumonia, and the results of this disease, particularly the so-called tubercular deposits (cheesy deposits), and tubercular infiltrations (pneumonic infiltrations).

4. That in such cases fresh catarrhal, and other acute intercurrent affections appear to be less frequent in high- than in low-level health resorts.

5. That in elevated regions, the tendency to absorption and fibrous transformation or cicatrisation of pneumonic deposits is promoted, while the tendency to the rapid breaking down of tissue, and the formation of cavities is counteracted.

6. That the tendency to hæmoptysis is diminished, and not, as is usually believed, increased.

I cannot conclude this paper without acknowledging that

[1] I do not wish to mix theory with facts, but it would be easy to base theories on the prominent characters of the winter climate, as the dryness of the soil in winter, the ground being covered with hard snow and ice; the diminished humidity of the air; the low temperature of the air; the comparative freeness of the air from foreign admixture, especially of organic nature; the greater number of clear days.

I am, with regard to the questions discussed in it, under great obligation to the late Dr. Archibald Smith, of Lima and Edinburgh, who not only has filled up the gaps in the histories of several of the cases related, but has also furnished me with the particulars of several other cases, and has given me the most valuable hints on mountain climates. His instructive publications on the climate and diseases of Peru are scattered through various journals, and are not much known; but a careful study of them will convince the reader that Dr. Archibald Smith deserves a foremost place amongst medical climatologists in the widest sense of the term, and thus amongst the benefactors of mankind.[1]

[1] I have not attempted many bibliographical notices in this communication, but I ought to mention that it was only after I had delivered the paper to the Society that several important contributions on the subject have come to my notice. 1. Dr. Drysdale "On Alpine Heights and change of climate in Consumption," from the 'Transactions of the St. Andrew's Medical Graduates Association.' London, 1869. 2. The second edition of Dr. Brehmer's work, 'Die chronische Lungenschwindsucht und Tuberculose der Lunge, ihre Ursache und ihre Heilung.' Berlin, 1869. 3. Dr. Spengler's 'Die Landschaft Davos, als Kurort gegen Lungenschwindsucht.' Basel, 1869.

CASES

OF

IRITIS OCCURRING IN SYPHILIS

TREATED WITHOUT MERCURY;

WITH REMARKS ON THIS FORM OF IRITIS.

BY

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Received March 27th.—Read May 25th, 1869.

The treatment of simple iritis without mercury has, since its advocacy by Saunders in 1810,[1] been occasionally tested by other surgeons, but the practice has not met with a favorable reception, and, therefore, has not been largely adopted, although it yielded very good results.

The conviction so long entertained, that a mercurial course was essential for the cure of all deep-seated inflammations of the eye, has, of late years, been greatly modified for the non-specific varieties; but mercury is still taught to be the only remedy, in those forms of disease which are caused by syphilis, that will prevent total disorganisation of the eye, or, at least, its very serious impairment.

[1] 'Treatise on some Practical Points relating to Diseases of the Eye.' By J. R. Farre. 1811.

So strongly, indeed, has this impression prevailed, that most of those surgeons who have attempted to treat other syphilitic disorders without mercury, have, on the occurrence of iritis, at once resorted to the use of this drug, as indispensable for the eye affection.[1]

A sufficient number of cases has, however, been recorded to show that the iritis which supervenes during syphilis, may pass to a successful issue without the employment of mercury;[2] but, so far as I am aware, the simple method of treatment has never been systematically carried out in such cases with a view of testing its efficacy.[3]

That this form of iritis, when left to itself, does not necessarily pass on to destruction of the eye, is sufficiently proved by the number of persons met with in practice, who, without any treatment whatever, have recovered from an attack. In many of these cases, however, irregularity of the pupil remains, although vision may be good.

The fact also has long been recognised, that iritis will

[1] Guthrie, 'Lond. Med. Gaz.,' 1829, vol. iv, p. 509; 'Med.-Chir. Trans.,' vol. viii, p. 545, 1820.

Hennen, 'Principles of Military Surgery,' 3rd edition, 1829, p. 555.

Rose, 'Med.-Chir. Trans.,' vol. viii, p. 347, 1820.

Syme, 'Principles of Surgery,' 3rd edition, 1842, p. 457.

Egan, 'On Syphilitic Diseases,' 1853, p. 167.

[2] Thomson, J., "On the Treatment of Syphilis without Mercury," 'Edin. Med. and Surg. Journ.,' vol. xiv, p. 84, 1818.

Hill, S., "On the Simple Treatment of Syphilis," 'Edin. Med. and Surg. Journ.,' vol. xviii, p. 567, 1822.

Carmichael, 'Observations on the efficacy of Turpentine in the Venereal and other deep-seated Inflammations of the Eye, &c.,' 1829.

Desmarres, 'Traité théorique et pratique des Maladies des Yeux,' vol. ii, 1855.

Boeck, 'Recherches sur la Syphilis,' 1862.

Williams, H. W., 'A Practical Guide to the Study of Diseases of the Eye.' New York, 1862.

Bidenkap, 'Aperçu des différentes Méthodes de traitement employées à l'Hôpital de l'Université de Christiania contre la Syphilis,' 1863.

Teale, T. Pridgin, jun., "On the relative value of Atropine and Mercury in the Treatment of Acute Iritis," 'Ophthalmic Hospital Reports,' vol. v, part ii, p. 156, April, 1866.

[3] Mr. Teale resorted to the employment of mercury in those cases where atropine failed to dilate the pupil within twenty-four or forty-eight hours (*loc. cit.*, p. 158).

sometimes occur in syphilitic subjects who are undergoing treatment by mercury, or even when they are fully under its influence; but in these patients, it does not appear that the disease is less severe, or passes to a more favorable or rapid termination, than in others who have not been taking this medicine, and I am strongly of opinion that, in such cases, recovery is retarded by a persistence in the use of the drug.

Examples, moreover, are not infrequent where mercury, though fully administered, fails to control the progress of the affection, but which begins to improve when this drug is discontinued and other remedies are employed.[1]

Since mercury, then, seems often to be inoperative to prevent, or moderate, or arrest, an attack of syphilitic iritis, it is difficult to believe that the medicine can exert such a powerful influence over the disease as has been ascribed to it; but it was not until I had seen Dr. Boeck successfully treat, with atropine drops and opium only, severe iritis in two patients who were undergoing the process of syphilisation in the Lock Hospital,[2] that I ventured to try the simple method of treatment, and I have since employed it in the eighteen cases which are now brought before the Society.

As iritis commonly supervenes whilst other syphilitic symptoms are present, many patients are already under treatment—often mercurial—when the affection manifests itself. The number of cases, therefore, which are met with uncomplicated by a previous specific treatment is not large, and I have only *seven* such to record. (Class I.)

In those patients who were attacked with iritis whilst taking mercury for other syphilitic disorders, yet did not show its action upon the gums, the drug was at once discontinued and replaced by simple remedies; but, as it might be urged that the successful issue in these cases was to some extent due to the influence of mercury, they have been included in a separate list; of such, *eleven* examples are recorded. (Class II.)

[1] Colles, 'Practical Observations on the Venereal Disease, and on the Use of Mercury,' p. 165, 1837.

[2] 'Med.-Chir. Trans.,' vol. l, pp. 290 and 300, 1867. Cases 5 and 15.

During the period that these patients were under observation, several others who had been treated with mercury also came under my care, but, as in some the gums were affected, and in others the eye was already injured permanently, they have not been included in the accompanying table, although they were subjected to the same plan of treatment. These cases afforded good opportunities for comparison with those submitted early to a simple treatment, and they certainly did not give such favorable results; this, however, may have been owing to some negligence on the part of the patient.

The plan pursued in the following cases, was to place two or three drops of a solution, containing four grains of atropine to an ounce of water, carefully neutralised, in the eye three or four times daily, until the pupil began to dilate, and then twice or once, continuing its use for some days after the lymph had disappeared from the iris and the pupil had become regular, or so long as forced dilatation seemed to be exercising a beneficial effect upon the adhesions. The eye was frequently bathed with warm water and shaded from the light; if conjunctivitis were severe, a weak alum and opium wash was employed. In six cases where there was great congestion, leeches were applied to the temple; in some others blisters were used, and repeated as often as was thought necessary. When there was pain, opium was given internally until relief was obtained, and sometimes a belladonna ointment was smeared around the orbit, but I could not satisfy myself that this was of much service in allaying pain. If the patient's health were impaired, tonics of various kinds were given, and, in cases of old-standing syphilis, iodide of potassium was combined; in persons much debilitated wine was also given. A simple saline mixture was ordered when febrile symptoms were present. A meat diet was allowed whenever it could be taken, and the patient was permitted to walk about with the eye shaded.

Three of the cases were treated as out-patients at St. Mary's Hospital, and four others, treated in private, would not submit to remain in-doors.

The cases recorded in the accompanying table show that the iritis which occurs in syphilis is not only amenable to a simple local treatment, but that the results obtained are to the full as satisfactory as when mercury has been employed.

In all the recent cases, the eye completely recovered; whilst in those of longer duration, and in which the iris had contracted adhesions before local treatment was adopted, useful vision was regained in all and perfect vision in most.

The average time during which the atropine drops were continued, was about twenty-six days, the shortest period being fourteen, and the longest forty-nine.[1]

The effect of the atropine upon the iris was not in any degree diminished by prolonged use, but after dilatation of the pupil had once been established, it could readily be maintained without intermission.

None of the injurious local effects, which are stated to have been occasionally produced by atropine, and have been urged as objections to its use,[2] were observed in any of these cases; but, on the other hand, the drug did not appear to relieve the pain, or control the inflammation.[3]

Although a strong solution of atropine was very freely used, no constitutional effects were produced, and if such symptoms, which have been attributed to the absorption of atropine from the local installations, ever do occur, they must be extremely rare. Allusion has been made by more

[1] In Mr. Teale's cases ('Ophthalmic Hospital Reports,' vol. v, p. 156) the average time during which atropine was used was somewhat greater than in these.

[2] Ch. Deval, 'Traité théorique et pratique des Maladies des Yeux,' 1862, p. 296.

Critchett, "Lectures on Diseases of the Eye," 'Lancet,' 1854, vol. ii, p. 206.

Velpeau, 'Leçons Orales de Clinique Chirurgicale,' 1841, p. 512.

Gerhard, 'Gazette Médicale,' 1851, Nos. 41 and 44.

'Ophthalmic Hospital Reports,' April, 1868, p. 119.

[3] Desmarres, 'Traité théorique et pratique des Maladies des Yeux,' 1855, vol. ii, p. 450.

Wecker, "Etudes Ophthalmologiques," 'Traité théorique et pratique des Maladies des Yeux,' 1863, vol. i, p. 370.

than one author to the possibility of such an accident,[1] but I am not acquainted with any recorded example.

In none of the cases which were submitted to treatment directly the iritis manifested itself, was any apprehension felt as to the result, for the pupil at once responded to the atropine, and soon regained its perfect shape; the lymph also became rapidly absorbed, so that, when treatment was abandoned, the full function of the iris was restored. When, however, inflammation had existed for some days and there was much effusion, the effect of the atropine was more tardy, and, in such cases, a week or even longer elapsed before dilatation was produced; they all, however, ultimately yielded to the action of the drug, more or less completely.

The mydriasis should be kept up, and the eye shaded for several days after the lymph has disappeared, and the natural colour of the eye returned. In two of the most favorable cases (6 and 7) where this precaution was not taken, a relapse occurred; these second attacks were more severe than the original, but they yielded readily to the same measures.

In eight of the patients, iritis had existed for periods varying from three days to nearly a month before local treatment was commenced, and in two (15 and 17) the worst results were at first feared; both, however, recovered without much impairment of vision. In these, as well as in three other cases of old standing (2, 9, 12), irregularity of the pupil remained, but, in each instance, its circular form and extent of mobility were much improved by persistence in the use of the atropine.

Double iritis occurred in four patients (5, 8, 13, 14), but the disease was much less severe in the eye last affected, so that a few days sufficed for its recovery.

Remarks.—The iritis which occurs during syphilis presents itself under two forms, which differ so much in their symptoms and mode of origin that I am led to regard them as two distinct affections. One of these I believe to be the result

[1] Bumstead, 'The Pathology and Treatment of Venereal Diseases,' 1865, p. 580.

of the syphilitic contamination, whilst the other, which is by far the most common, does not appear to me to be so.

The first variety commences in the substance of the iris itself, and has been termed *iritis parenchymatosa;* it occurs during the later, or tertiary, stage of syphilis, and generally leads to some grave lesion of the eye.

The other, which is slight and superficial, attacks the surface of the iris and membrane of the aqueous humor, and has been well named *iritis serosa* or *peri-iritis*;[1] it accompanies the earlier or secondary manifestations of syphilis, and is not usually a serious affection.

Most of the cases of iritis met with in syphilis belong to this latter variety: they are ushered in by a subacute inflammation of the conjunctiva, which, in common with the other exposed mucous surfaces of the body, is peculiarly liable to become congested from slight causes in syphilitic subjects. The previous conjunctival inflammation, which seems to me to be very constant in these cases of iritis, is scarcely alluded to by authors, but Beer[2] and Sichel[3] admit that slight external causes which probably would not affect the eye of a healthy person will often determine an attack in one who is syphilitic; whilst Melchior Robert[4] states definitively that iritis is often preceded by inflammation of the conjunctiva. Irritation of the conjunctiva, from whatever cause, always occasions an immediate contraction of the pupil; and the narrowing of this aperture, which is so con-

[1] Virchow, 'La Syphilis Constitutionelle,' traduit par Paul Picard, p. 146. Paris, 1860.

[2] 'Lehre der Augenkrankheiten,' vol. i, pp. 547—8, 1792. Beer names the iritis which commences in this manner *secondary syphilitic iritis*, in contradistinction to that form of the disease which originates in the iris itself, and is styled by him *primary* or *genuine syphilitic iritis*.

[3] 'Iconographie Ophthalmologique,' p. 122, 1852. Sichel uses this expression—"Le plus souvent, malgré une infection constitutionelle bien declarée, l'œil conserve son immunité jusqu'au moment où une cause locale (traumatique ou atmosphérique), agissant sur lui et produisant une ophthalmie externe simple ou rhumatismale, en fait un centre d'attraction pour le travail syphilitique."

[4] 'Traité des Maladies Vénériennes,' p. 596, 1861.

stant that it has been regarded as diagnostic of commencing iritic inflammation, may be thus explained even though the iris is not yet involved.

In these cases which do not seem to originate in syphilis the iris is not primarily attacked, but the eye affection commences with congestion or subacute inflammation of the conjunctiva, more especially in that portion of it which covers the sclerotic and receives its supply of blood from the anterior ciliary vessels. Branches of these vessels are also freely distributed to the iris, so that engorgement of this part of the conjunctiva is speedily followed by congestion of the iris; but the vascular zone around the margin of the cornea, so pronounced in acute iritis, is not usually very distinct in this form of the disease; nor is pain a constant symptom. Effusion of lymph in small diffused nodules takes place very rapidly upon the surface of the iris, especially about its pupillary margin, and the inflammation extends to the membrane of the aqueous chamber, occasioning turbidity of its humor; the cornea also may subsequently become involved.

The cases of iris which are thus developed, constitute the large proportion of those met with in practice; they are very amenable to treatment and a favorable termination may be confidently expected when the disease is recent, even though the inflammatiou be severe.

In the other variety of iritis, which is the result of syphilis, the disease commences in the iris itself, and this membrane becomes the seat of an indolent, almost painless, inflammatory action, accompanied by deposit of large yellow tubercles into its substance. The aqueous humor and cornea are but slightly implicated, and if the conjunctiva be affected it is secondarily to the iris. The deep-seated structures of the globe will also sometimes take on a chronic low form of inflammation, and then disorganisation of the eye is not an uncommon result, or, at least, some grave permanent lesion.

This form of the disease is essentially chronic, almost painless, and very insidious in its progress: it may affect both eyes in succession, and is occasionally attended by relapses,

which in some few obstinate cases will involve the eyes alternately for two or three times. The sight fails so gradually, and so little discomfort is experienced at first, that considerable injury is done to the organ before the patient appreciates the gravity of his condition, and, when he applies for treatment, but little can be done.

Examples of this kind are fortunately not very numerous; they occur generally in debilitated persons who are the subjects of the so-called tertiary forms of syphilis, and in whom tubercular eruptions, nodes, gummatous tumours, &c., are present.

The prognosis in these cases is very unfavorable, as the disease is but little controlled by treatment, and much injury to the eye usually remains in spite of all our efforts.

The effusions into the iris were long regarded as collections of ordinary lymph, which had a marked tendency to become organized and to contract adhesions; although this is still admitted for those cases where the inflammation is acute and the effusion general, yet there is much difference of opinion as to the real nature of those large masses of yellow deposit which are found in the more chronic form of this disease.

The first to recognise that they were not mere collections of inflammatory lymph was Beer, who, as long ago as 1792, described them as analogous to the condylomata found upon the genital organs—then called *cristæ galli*.[1]

This description of Beer's, although alluded to by succeeding writers, is not accepted by them, but they regard the deposits in the iris as fibro-plastic exudations resulting from inflammation, which ultimately become converted into pus;[2] they all however state that such abscesses are very rarely found except in cases of syphilitic iritis.[3]

[1] Op. cit., vol. i, pp. 558—580. He figures the condition at tab. ii, fig. 4.

[2] Mackenzie, 'A Practical Treatise on Diseases of the Eye,' p. 468, 1840.

Vidal de Cassis, 'A Treatise on Venereal Diseases,' translated by Blackman, p. 402, 1854.

Sichel, loc. cit., p. 121.

Cullerier, 'Précis Iconographique des Maladies Vénériennes,' p. 412, 1866.

[3] Lawrence, however, asserts that suppurative inflammation never takes place in this form of iritis. 'Treatise on Diseases of the Eye,' p. 287, 1833.

Von Ammon also considered these nodules in the iris to be effusions of lymph, and very properly observed that "there cannot be condylomata there, since these excrescences are only developed on the skin in the neighbourhood of the mucous membranes, and never on the serous membranes."[1]

Ricord's observations led him to describe three forms of syphilitic iritis coincident with, and corresponding to, the roseolous, papular, and pustular cutaneous eruptions respectively;[2] and this division has been adopted very generally by the French School. He also states that tubercles are sometimes formed in the iris, analogous to the tubercular eruptions of the skin, and gives a plate in illustration of this.[3]

Virchow considers these masses in the iris to be quite distinct from either a fibrinous exudation or an abscess;[4] and states that they are "the result of a proliferation, and not of an exudation," which takes place at the same time that the gummata are forming. In describing their composition, he uses almost the same words that he employs elsewhere for a gummatous tumour, and asks if this affection of the eye may not be termed "une iritis gommeuse?" He classes iritis, however, amongst the secondary affections of syphilis.

De Graafe (A.) examined one of these tubercles in an eye which he had excised, and confirms Virchow's opinion as to the perfect identity which exists between them and the recent gummata of tertiary syphilis. According to him, they consist of fibrinous exudations, granular amorphous matter, and pus-corpuscles; exactly similar, therefore, to the syphilitic deposits found in the liver and other internal organs. [5]

Nélaton acknowledges the resemblance between these

[1] F. A. Ammon, 'Annales de la Chirurgie Française et Etrangère,' 1844, t. x, p. 432.

[2] 'Traité de la Maladie Vénérienne,' par J. Hunter, traduit par G. Richelot, 2de edit., pp. 648 *et seq.*, 1852.

[3] 'Clinique Iconographique de l'Hôpital des Vénériens,' pl. 28, 1851.

[4] Op. cit., pp. 146—8. Paris, 1860.

[5] 'Archives für Ophthalmologie,' Bd. viii, t. i, p. 288. See also Stellwag (von Carion), 'Treatise on Diseases of the Eye,' translated by Drs. Hackley and Roosa, 3rd edit., p. 178, 1868.

masses in the iris and the gummata, but says that they differ in the former having no tendency to perforate the tissues which cover them.[1] Virchow, however, assigns this feature to them in a marked degree.

According to Wecker, these tubercles are composed almost exclusively of new cellular elements deposited in the connective tissue of the iris, and he describes them as answering in appearance "to the fleshy granulations of atonic wounds."[2]

Other writers speak of them as "vascular vegetations,"[3] "lymphatic exudations," "plastic concretions,"[4] &c.

Lancereaux classes iritis with the "secondary visceral affections;" that is to say, it occurs at a time when, although the secondary cutaneous manifestations of syphilis are present, deposits are taking place in the internal organs.[5] He is of opinion that, at this period of the disease, gummata may also be found in the iris, and thinks that this fact will explain "the existence of the pretended abscesses in syphilitic iritis, which are really only the last stage of the gummatous tumour."[6]

Although it will be seen that some difference of opinion exists as to the nature of the deposits found in syphilitic iritis, yet the investigations of the best modern observers go to show that these tumours bear a very close resemblance to those met with in other parts of the body in advanced constitutional syphilis, and that they are developed about the same time that deposits begin to take place in the internal viscera. The microscope further proves that these iritic tubercles consist of elements identical in all respects with those composing a gummatous tumour—a product unanimously assigned to that period of syphilitic disease when nodes, tubercles, ulcerations, &c., are present.

In this stage of syphilis, when the disease has effected a con-

[1] 'Elémens de Pathologie Chirurgicale,' vol. iii, p. 125, 1854.
[2] Op. cit., vol. i, p. 359.
[3] Sichel, op. cit., p. 121.
[4] Deval, op. cit., p. 294. Von Ammon, 'Ueber Iritis,' p. 267. Berlin, 1868.
[5] 'Traité historique et pratique de la Syphilis,' p. 173, 1866.
[6] Op. cit., p. 191.

siderable degradation of the system, mercury is by common consent excluded from the list of remedies, and every effort is made to improve the general health by a tonic treatment and a generous diet; and it is, moreover, in those cases of iritis which accompany the advanced forms of constitutional syphilis that a mercurial treatment has, in practice, been found to fail.

In that form of iritis, then, where these peculiar deposits are developed—and which alone I regard as true syphilitic iritis, since this condition of the eye is never met with unless syphilis be present—a non-mercurial treatment is indicated, as it occurs at a period of the constitutional disease when experience has demonstrated that mercury is not only unnecessary, but often even injurious.

And if, as I believe, the other variety of iritis (constituting the majority of the cases met with during syphilis) be a simple inflammation of the iris, induced by the previous conjunctival inflammation, then mercury is useless as a specific remedy, and can only be administered as an antiphlogistic. This property of the drug is still a *questio vexata,* and many ophthalmic surgeons have long since discontinued its use in those cases of iritis where they are unable to discover a syphilitic taint.

Although I have endeavoured to show that the employment of mercury is unnecessary for the cure of those forms of iritis which occur during syphilis, I am not insensible to the enormous value of the drug in various forms of syphilitic disease, but it is a medicine potent for good or for harm, and should only be administered in those affections which experience shows will not get well without it.

The number of cases in which I have tried a non-mercurial treatment for iritis in syphilis is at present but small; yet their successful issue sufficiently proves that a simple treatment is attended by results at least as good as when mercury has been employed.

ON A CASE

OF

FUSIFORM AND TUBULAR ANEURISM OF THE SUBCLAVIAN ARTERY,

AND ITS SUCCESSFUL

TREATMENT BY INDIRECT DIGITAL COMPRESSION.

BY

ALFRED POLAND, F.R.C.S.,

SURGEON TO GUY'S HOSPITAL.

TO WHICH IS APPENDED

A CASE OF SUBCLAVIAN ANEURISM SUCCESSFULLY TREATED BY DIRECT COMPRESSION.

By F. M. CORNER, Esq., of Poplar.

AND FOLLOWED BY THE NOTES OF

A SUCCESSFUL CASE OF AMPUTATION AT THE SHOULDER-JOINT FOR SUBCLAVIAN ANEURISM.

By PROFESSOR SPENCE, of Edinburgh.

Received March 30th.—Read June 8th, 1869.

Subclavian aneurisms, at all times, attract the serious consideration of the surgeon.

The following case is an example of one form of aneurism of this artery, of great rarity and interest, involving many points of obscurity, which we shall briefly attempt to elucidate. The main features, to which our attention will have to be drawn, are:

1. The remarkable deviation from the normal course of the subclavian artery on the right side, and in its external third

2. The peculiar character of the aneurism,—it being of the fusiform or tubular variety of aneurism by dilatation, where all the coats are uniformly involved.

3. The treatment adopted, viz., indirect compression through digital pressure on the proximate or cardiac side of the tumour, leading to a successful issue.

Patrick G—, æt. 44, was admitted into Guy's Hospital on October 7th, 1867, under the care of Mr. Poland. He was a bricklayer's labourer, but for several years previously, had been employed at the gas works, where he had done much heavy work and been exposed to great heat. Latterly, he had been in the habit of carrying a load of bricks over the right shoulder, until he was obliged to desist, from the severe pain in that region. With the exception of an attack of rheumatism, ten years ago, chiefly affecting the left shoulder, he had always enjoyed good health until about two years back, when he suffered from occasional pains in the right arm and the limb itself became weaker. He attributed this to an injury of the right index finger received about that time, which was attended with inflammation, but this subsided, and the wound healed in three weeks. During the last month, the pain in the arm became more severe and continuous; it was of a gnawing character, chiefly confined to the fore-arm but extending occasionally upwards to the shoulder, and was more especially worse at night. He was thus compelled to give up work, and seek medical advice, when he was treated for rheumatism. The pain continuing unabated, he applied to Dr. David Johnson, of the Old Kent Road, who at once discovered a pulsating tumour above the clavicle, of an aneurismal nature, and advised the man to seek admission into a hospital immediately, that he might undergo the treatment necessary for it. The patient was quite unaware of the presence of a tumour, and was not at all disposed to attribute his sufferings to it.

On admission, the man's expression was somewhat anxious, but he appeared to be fairly nourished, and his general health was good. The right arm was weak, but he could perform easy motion with it: its circumference was three quarters of an

inch less than that of the left arm, both over the biceps and in the fore-arm. He complained of pain down the radial border of the fore-arm and in the index finger, occasionally extending upwards to the acromion process. There was numbness in the fingers and in the hand generally, but there did not seem to be any impairment of actual sensation. The arm was always cold, and had to be wrapped in flannel. There was evidence of deficient nutrition in the nails of the fingers of the right hand, which were ill-developed and desquamating. There was very little superficial fat about him, so that the relations of the tumour in the neck could be readily made out. In the right supra-clavicular triangle was a pulsating tumour of the size of a large filbert, fusiform in shape, passing downwards and outwards so as to meet the clavicle at an angle of forty-five degrees; it was more than an inch in length, and nearly half an inch in breadth at its widest calibre; above, it diminished gradually to the size of a large goose quill, and, after remaining for about a quarter of an inch of that size, it curved downwards and inwards and was lost under the muscles; below, the tumour did not seem to diminish so rapidly, but the pulsation of the artery could be felt between it and the clavicle, as well as very distinctly below that bone. The tumour was almost subcutaneous, and the pulsations in it very strong; the expansion, which was uniform, being very considerable during each beat. There was no doubt as to its aneurismal nature, and, on careful examination of the neck, the subclavian artery was found to have taken an unusually high course, and to be supported, moreover, by a bony structure, which was too high for the first rib. When pressure was applied to the unaffected portion of the artery above the tumour, the pulsation was readily stopped and the tumour became quite soft and could be emptied. The pulse could be felt in the right radial artery or, in fact, in any artery of the right arm, up to within a short distance below the clavicle; there was no tumour or swelling along the course of these vessels, and the axilla was quite free from induration or glandular enlargement.

After a few days' rest, it was decided to try the effect of continuous digital pressure on the cardiac side of the tumour; and the whole of the arrangements for carrying out this plan were entrusted to the dresser, Mr. W. D. Lovell. The compression was managed by placing the thumb upon the artery leading to the tumour, and by gentle pressure against the bony support to the artery behind, with a very slight amount of force, the pulsation was completely arrested. The pressure could be kept up by the same person for twenty minutes or longer without any inconvenience; it was continuously carried out for ninety-six hours, with the exception of a few minutes' interruption. The patient, soon after the commencement, complained of pain in the right shoulder and arm with numbness in the fingers, and the temperature of the arm also became less; as he was disposed to be irritable, and as he suffered much pain, a grain of opium was ordered every six hours, which had the desired effect. After the first twenty-four hours he became very faint, and a little brandy and water was given; he was kept on low diet with beef-tea. About the forty-eighth hour the tumour appeared to be rather smaller and harder, but it still received impulse from the heart's action. At the sixtieth hour he became very restless and excited, and notwithstanding the opium this condition lasted over two hours, but it was probably attributable to the manner in which the pressure had been applied by those in charge; when this was remedied, he became more comfortable, and soon had an hour's continuous rest. At the seventy-second hour, it did not appear that much progress had been made; he had another severe attack of faintness, and as he was under the influence of opium the quantity was ordered to be decreased; subsequently he again became very restless, and had profuse perspirations; he said he could not bear the pressure any longer, but by persuasion, however, it was still persevered with, precautions being taken to guard the integuments which were now becoming very red and tender. There was some difficulty in maintaining an uniform compression, in consequence of his irritability and tossing about; he also complained of violent headache, and

had an anxious expression of countenance; the left pulse was feeble and about sixty. Under these circumstances, at the ninety-sixth hour, pressure was left off, much to the patient's relief, and he then slept heavily for several hours. The tumour at the time of discontinuing the pressure was undoubtedly much smaller and harder, and although pulsation in it could still be felt, yet this was more readily controlled by very slight means. After recovering from the immediate effects of the treatment, he left the hospital at the end of the month.

He again became the patient of Dr. Johnson, who kindly looked after the man, and occasionally sent him on to the hospital to report himself. Soon after his discharge, the pulsation began gradually to diminish and the tumour to become more solid, so that at the end of a month there was no pulsation whatever in it; the pain in the shoulder and arm had considerably decreased, but was not entirely lost.

On December 15th, 1867, the tumour was very carefully examined; its shape and position were not altered, but its size was slightly diminished; it had become quite firm and hard, and there was not a trace of pulsation in it. He had still slight pain in the arm, and although it remained cold and pulseless, the weakness of the limb was the only reason which prevented him from working.[1]

Now the first interesting point for consideration is the peculiar anatomical deviation, which, in this instance, was of most essential service for the mode of treatment adopted, and which, in a great measure, led to the successful result. Had the artery run its natural course, the aneurism would have been placed in the axilla, and would probably have re-

[1] This patient has been seen at intervals during the present year, and Dr. Johnson in a note dated July 30th, 1869, reports, "I have seen your patient this day, he declares himself as well as ever he was, and can do as much work without experiencing any discomfort. The temperature of the affected arm is natural, but the limb is still somewhat wasted. There is no return of pulsation in the brachial, ulnar, or radial, arteries. There is no vestige of the subclavian artery in the supraclavicular region, but there is a large artery crossing transversely across the space."

mained unnoticed until it had acquired a large size, or until it had burst; a condition not unfrequent in subclavian and axillary aneurisms.

In the present case, however, the right subclavian artery emerged from between the scaleni muscles fully two inches above the clavicle, or rather more; it then took an almost vertical yet oblique course to gain the axilla, and passed behind the clavicle a little to the inner side of the junction of the external third with the internal two-thirds of that bone. The whole course of the artery in this its third portion was three inches and three quarters in extent. The first rib appeared to be higher than usual, and could be readily traced coursing round the inferior part of the neck above the clavicle; and the artery lay upon the rib, passing over and extending some distance beyond it, previous to being lost under the clavicle. The tubercle of the first rib could not be distinguished. The condition gave the idea of the clavicle and shoulder having been let down for some distance, so as to leave the first portion of the axillary artery in the neck. A very similar state of things existed on the left side, but not to so great an extent.

On referring to Quain's Commentaries on the Arteries, he alludes to this arching of the subclavian artery in the neck, and gives the measurements of cases coming under his notice; in Plate 20, fig. 3, a drawing is given, which somewhat represents the condition found in the present case. Dupuytren[1] also adverts to the superficial condition of the third portion of the artery in those who are thin and have long slender necks, with lean and pendulous shoulders.

The deviation of the artery is not of unusual occurrence, and may be due either to a natural or to an acquired condition. In the recent volume of the 'Guy's Hospital Reports' (1869, p. 445) are recorded two specimens observed in the dissecting-room during a very short period; the height to which the vessels rose in the neck, was such as to render the direction of the third portion of the artery almost vertical; it occurred in one instance on the right side, and in the

[1] Dupuytren, 'Leçons Orales,' t. iv, p. 528.

other on the left, the artery emerging from the scalenus fully an inch and a half above the clavicle.

Mr. Cock has informed me that during a recent examination for the Fellowship of the Royal College of Surgeons, the artery took the above unusual course, and the candidate failed to secure it by the ordinary operation. This failure has occurred to a hospital surgeon in a case recorded by M. Dubrueil,[1] where the axillary artery had to be secured in consequence of not finding the subclavian in its usual position.

The acquired displacement of the artery has generally been due to the pressure of tumours from below upwards, or to an exostosis of the first rib, several cases of which are recorded by Mott,[2] Gregg,[3] and others.

Dr. J. W. Warren of Philadelphia in his recent work, 'Surgical Observations,' narrates a singularly interesting case of acquired deviation of the subclavian artery, which became the subject of aneurism and required operative measures. He was enabled to ligature the artery external to the scalenus muscle, on the cardiac side of the tumour. The case bears a strong analogy to the condition found in my own, as regards the feasibility of successful treatment, but it differs as to the cause of the deviation. The following is an abridged account of the case.

Miss A—, æt. 30, of delicate constitution, had a congenital club-foot of the worst kind, and, in consequence, a double curvature of the spine. For the former of these she was treated eight or nine years since, and the foot, after section of the tendons followed by appropriate treatment, was brought into its natural position, so that she was able to walk without any mechanical support. The curvature of the spine was also submitted to treatment, and with the same successful result. In the early part of December, 1847, she consulted Mr. Warren for an aneurismal tumour, about the

[1] Dubrueil, 'Gaz. Méd. de Paris,' 1837, p. 562.

[2] Mott's edition of 'Velpeau's Surgery,' vol. ii, p. xxxviii.

[3] Gregg, 'Dublin Journal,' vol. xxv, p. 211, 1858.

size of a pigeon's egg, just above the scapular end of the left clavicle, of which she gave the following history. Four months ago, whilst in attendance on a sick brother, she had occasion to draw the cork from a bottle, and felt at the moment a sudden crack at the point where the present tumour is situated. She paid no attention to it at the moment, but a short time afterwards a small swelling, having a decided pulsation, was distinguished at that spot, which has gone on increasing in size up to the present time.

The tumour pulsated strongly and possessed the usual thrill characteristic of an aneurism. On endeavouring to discover the subclavian artery in its natural situation behind the clavicle, at the point where it passes over the first rib, no large vessel, nor any osseous protuberance answering to the tubercle of the first rib, could be found. Different parts of the neck were carefully explored, and a large artery was found passing obliquely upwards, parallel to, and about an inch from, the external border of the trapezius muscle. When compression was made at this point pulsation in the tumour ceased, as well as in the pulse at the wrist. There was no question that this was the subclavian artery, and on seeking for the first rib both this and part of the second rib were felt passing obliquely across the neck above the clavicle. The insertion of the scalenus anticus muscle into the first rib was at length distinguished; the tubercle, however, was not sufficiently developed to be manifest to the touch. The whole osseous system of the chest, in this case, seemed to have undergone a partial displacement. The spine and ribs had been, as it were, moved upwards, while the sternum was carried in an opposite direction. Pressure could not be borne on the vessel above the tumour, in consequence of the pain and numbness produced, and on careful examination the whole of the brachial plexus of nerves could be discriminated in immediate contact with the artery. The anatomical peculiarity in the position of the vessel enabled Mr. Warren to apply a ligature to the third portion of the artery. The case was perfectly successful, but the ligature did not come away until the ninety-sixth day.

Besides the deviation of the artery from its natural course in my case, there was another anatomical peculiarity to which allusion must be made, viz. the probable existence of a cervical rib which gave support to the artery from behind. These extra cervical ribs are not very common. There are three specimens in the Museum of Guy's Hospital; Sandifort[1] and Quain[2] give delineations; and there are a few others on record. Dr. Ludwig Stiele[3] has ably discussed the subject of cervical ribs; Halbertsma[4] has endeavoured to ascertain the position of the subclavian artery in cases where there is a cervical rib, but he could not positively determine whether the vessel takes its ordinary course over the first dorsal rib, or whether it passes over the cervical rib. His observations are expressed in the following table:

No.	Reference.	Cervical rib.	Length.	Relation of subclavian artery.
			Centi-metres.	
1	Found in body of an aged female	Right side	6.0	Supports the artery.
		Left side	6.0	Ditto.
2	Sandifort Museum	Right side	6.5	Ditto.
3	Found in skeleton about twelve or fourteen years old	Left side	5.6	Ditto.
4	In the Vrolik Museum	Right side	2.5	Does not support the artery.
		Left side	6·5	Supports the artery.
5	Dr. R. Adams, of Dublin (see case appended)	Left side	5.1	Does not support the artery.
		Right side	5.6	Supports the artery.

Paget[5] has recently alluded to a cervical rib in a female,

[1] Sandifort, plates, vol. ii, tab. 49, figs. 1 and 2.

[2] Quain's 'Commentaries on the Arteries,' plate xxv, fig. 9, from preparation in Museum at Cambridge.

[3] Stiele, Virchow's 'Anatomie u. Physiologie,' 1846, vol. xxxvi, p. 425.

[4] Halbertsma, 'Archiv für Holland. Beitragen zur Natur. u. Heilkunde,' 1858, band i, s. 47.

[5] Paget, in Callender's "Communication on Ruptured Axillary Artery," 'St. Bartholomew's Hospital Reports,' vol. ii, p. 104.

aged forty, who had a diffused aneurism of the left axillary artery, and in whom the bony growth projected so that scarcely any room was left behind the clavicle for the finger to be pressed down upon the third part of the course of the artery. It is very probable that this was a short cervical rib, and consequently did not support the artery.

We may then with Henle[1] conclude that, when there is a supernumerary cervical rib extending at least 5·6 centimetres in length, the artery passes over and is supported by it, and this was probably the case with the patient under my care.

This leads us now to the second point of interest, viz., the *character of the aneurismal tumour*. It was one of those peculiar forms of aneurism variously known by the names of fusiform, tubular, or natural, aneurism, or aneurism by dilatation. There was no doubt in my mind, nor in that of my colleagues who examined the case, that the abnormal tumour which presented itself was solely due to a circumscribed dilatation, or expansion, of the entire circumference and calibre of the subclavian artery at a given point. It was remarkably defined at its upper end, and somewhat tapering below towards the clavicle and axilla; it was not a partial, or what is called a *false*, aneurism, *i. e.*, an out-dilatation or tumour from the side of a vessel, and involving only a small portion of its walls, but it was a pure distension of the whole of the arterial coats equally on all sides—a distinct tubular enlargement, increasing the capacity of the artery to a very large extent and allowing fluid blood to pass readily along it, and in so doing modifying, of course, the force of the current of blood through it, but in nowise permitting the chance of any coagulation on its walls. A question naturally suggests itself as to whether this enlargement be, or be not, due to a diseased condition of the vessel at the site of the dilatation—whether the inner tunics from some morbid change had given way and allowed the occurrence of this distension; or whether, all the coats being entire, the

[1] Henle, 'Handbuch der Anatomie,' "Vascular System," p. 249.

muscular one had become weakened or degenerated in its structure, losing therefore its peculiar properties and allowing the expansion of the tube; or whether it was a pure dilatation without any diseased condition of the vessel, in fact a dilated artery? These are perplexing questions, and can only be answered by the further examination and more careful investigation of such cases, and this has not hitherto been done satisfactorily.

What is the difference between a dilated artery and an artery the seat of aneurismal dilatation? Such a question is well worth investigating both anatomically and pathologically, and especially as regards the microscopical examination of the coats. Scarpa[1] evidently had seen or was aware of this peculiar condition of artery in reference to aneurism, and he has endeavoured to elucidate the question of aneurismal dilatation of the arteries; Hodgson[2] also has devoted a section to the subject. Breschet[3] distinguished four kinds of aneurismal dilatation of all the coats, and among these he placed the spindle-shaped aneurism and the true cylindrical aneurism, which in many respects correspond to the aneurismal tumour under consideration. Broca[4] seems rather disposed to attribute these enlargements of the vessel to the giving way of the internal coats, and throws doubt as to whether they are always natural dilatations of all the coats; hence he places them under the denomination "of mixed external fusiform aneurisms." His views are certainly corroborated by the oft-quoted case of fusiform aneurismal dilatations of the femoral artery, recorded by Monro,[5] where the condition was considered to be simple dilatations of all the coats, but which on more minute dissection proved to be due to atheromatous disease of the internal coats.

There can be no question that an artery may become

[1] Scarpa, Wishart's 'Translation,' p. 57.
[2] Hodgson 'On Arteries,' p. 45 and 58.
[3] Breschet, 'Mém. Chir. sur différentes espèces d'Aneurismes.'
[4] Broca, 'Sur l'Aneurisme,' p. 22.
[5] Monro, 'Essays and Obs. Phys. and Lit. Edin.,' vol. iii.

dilated to a greater or less extent, and in more than one place, throughout the whole circumference of its calibre owing to disease of the internal or middle coats; a true ovoid or fusiform aneurism is thus formed, and it is remarkable how often this condition is found in the subclavian and axillary arteries. Yet, on the other hand, may we not have a local dilatation of an artery without any disease of the internal coat?

The distinction is one of paramount importance in our prognosis and treatment; for in the one instance there is liability to extension and sudden rupture, if the aneurism be not attended to; whilst in the other the disease may remain quiescent for a long period of years.

I cannot but think that in my case the internal coats were atheromatous, and that if treatment of some kind had not been adopted a false aneurism, or more likely rupture of the vessel, would have occurred.

Vacca Berlinghieri[1] has described the case of a man, æt. 60, who had, for a period of twenty-four years, been the subject of aneurismal dilatations of both his subclavian arteries; that on the left side seemed to be purely a dilatation of all the coats, whilst that on the right had latterly assumed a really aneurismal character.

But the most unique case of a dilated subclavian artery assuming an aneurismal character, was laid before the Dublin Pathological Society in March 1839, by Dr. Robert Adams of the Richmond Hospital; there were but few notes accompanying the preparation, so that, on communicating with Dr. Adams on the subject, he has transcribed the report of the case (which has never been published) from the hospital books, and has kindly permitted me to make use of the same.

"J. N—, æt. 55, a labourer in a brass-foundry, was admitted under the care of Dr. Robert Adams into the Richmond Hospital in May 1836, on account of an attack of

[1] Quoted in the 'Sammlung eisiger Abdandlungen von Scarpa, Vacca Berlinghieri, und Ucelli über die Pulsadergeschwülste, von Dr. Seiler.' Zurich, 1822, p. 140.

inflammation which had involved all the structures of his left eye. The eye had been lost three years previously and was totally disorganized, and he was now suffering from recurrent inflammatory action. While the patient was undergoing palliative treatment, it was observed that he had a pulsating swelling in the supra-clavicular region of the left side, of which he never complained or even made mention until he was interrogated on the subject by the resident pupil of the hospital. His aspect was that of one who had lived too freely, his complexion being of an unhealthy sallow cast; his occupation was a most unwholesome one, and he was the subject of an habitual chronic cough. When asked about the swelling he stated that a few weeks before his admission he, for the first time, noticed a 'beating' above the centre of the left collar-bone, but as there was no swelling and no pain he quite disregarded it.

"In the left supra-clavicular space there projected a pulsating tumour; it was not very prominent, and was of an ovoid shape and transverse in direction; it became more manifest when the shoulder was depressed. The integuments over it were natural in appearance. Pressure on the artery at the outer margin of the scalenus muscle stopped all pulsation in the swelling, as well as in the radial artery. When the naked ear was applied closely to the supra-clavicular region and to the tumefaction, there was no 'bruit de souffle' audible; when the patient coughed the pulsation at the moment ceased in the tumour. Behind and to the inner side of this swelling a hard prominence could be felt, either arising from a malformation of the first rib, or perhaps from some prolongation of the transverse process of a cervical vertebra. On lifting up the tumour and drawing it somewhat forwards, which could partially be effected by pressing the fingers behind it, the swelling (that is to say, the arterial part of it) was shown to be much smaller in reality than might have been imagined. Upon this examination and this manipulation of the tumour, the idea occurred to my very intelligent clinical clerk, Mr. Bradshaw, and myself, that the lesion in this case was a fusiform dilatation of the left subclavian artery as it passed

through its third stage, and which fusiform swelling had not yet attained any considerable size. This was the diagnosis arrived at and entered in the hospital case book soon after the admission of the patient in 1836.

"The prognosis formed at that time as to the course the disease seemed likely to take was favorable, and I expressed my opinion to my clinical class that I knew of no treatment necessary so far as the arterial lesion was concerned.

"On examining the supra-clavicular region on the right side, some abnormal condition of the first rib could also be made out, but no aneurismal swelling could be either seen or felt; there was observed only an inordinate activity of pulsation marking the course of the artery. I may add that there was nothing abnormal observed in the sounds of the heart, the action of it was regular and moderate; the pulse was of equal strength in both radial arteries, and it averaged about 78 per minute.

"The patient having been relieved of the inflammation and agonising pain in the left eye was discharged. Subsequently such was the general delicacy of his health that he was unable to support himself and was obliged to take refuge in the poor-house of that day—within the walls of the House of Industry Hospital establishment; and it became my duty, as junior surgeon, to visit N— occasionally, and I had to remark that the fusiform swelling of the left subclavian never seemed to undergo any change; the man suffered no pain, there was neither decrease nor increase of pulsation nor of swelling up to the period of his death, which was the immediate consequence of an attack of typhoid pneumonia in March, 1839.

"*Post-mortem.*—The principal part of the swelling which occupied the supra-clavicular region of the left side was seen to have been constituted, as diagnosed in May 1836, by a fusiform dilatation of the left subclavian artery. This dilatation occupied the vessel for the length of three inches of its course; the increase in the calibre of the vessel commenced at a point about half an inch external to the outer

margin of the scalenus anticus, and gradually the dilatation became greater for two inches and a half. The tube became somewhat diminished in size as it entered within the boundaries of the axillary region, but it was not reduced to its normal dimensions until the artery became brachial. The fusiform swelling of the artery, when all the surrounding structures were removed, appeared to be much better defined, and smaller, than might have been imagined from a mere superficial inspection of the supra-clavicular region; but a careful examination and manipulation of the swelling during the lifetime of the patient had prepared us for seeing the condition of the vessel which has just been adverted to. The ovoid swelling was about the size of a pigeon's egg and occupied the third stage of the artery. The lining membrane, as well as the middle and external coats of that portion of the artery affected by the swelling were perfectly healthy. These tunics did not appear to be atrophied or hypertrophied; neither did the dilated portion of the vessel in any part of its course contain coagula.

"The bony prominence which had been felt behind the subclavian artery, and which contributed to constitute part of the projection on the surface of the supra-clavicular region of the left side, was now considered to be due to a congenital deformity and abrupt termination of the first rib. The right first rib was also shortened and malformed; it could be felt, but it was not seen projecting in the neck. That on the left side was very straight, only two inches in length, of a phalangiform appearance, and terminated anteriorly in a hard flattened extremity; this was connected inferiorly by a diarthrodial joint with a process of bone which grew up from the second rib just at its angle, the articular surfaces being covered with cartilage. The rib on the right side was larger, more curved, and measured two and a quarter inches in length; this had a ligamentous connection with the second rib, and from the upper edge of its anterior extremity there projected a long, sharp, spiculous growth. The left subclavian artery ran in front of the distal extremity of the malformed rib, and was

supported by the bony elevation of the second rib; the right artery was supported on the shortened first rib."

Dr. Adams remarks, "What these costal malformations had to do with the dilatation of the left subclavian artery, or with the abnormal irritability of the right subclavian, I feel quite at a loss to conjecture."

"Strict examination was made as to the condition of all the other parts of the circulatory system, and all these structures were found sound. The lungs presented the usual morbid phenomena of typhoid pneumonia."

Dr. Adams adds, "The great point of interest in the case, and what alone made me bring it before the meeting of the Pathological Society, was the singularity of it, controverting by a fact Scarpa's views that in all cases the internal coat of the artery had given way. Certainly there was no atheromatous degeneration of the internal coat, nor any thickening of either the middle or external coat, and the circumstance of the dilatation not having undergone any increase while under observation for three years would seem to imply, that the peculiar lesion consisted in a fusiform dilatation unaccompanied with any special weakening of any of the three tunics, or with any rupture whatsoever."

Dr. Adams, in reply to further inquiry respecting the possibility of the costal malformations being cervical ribs, states, "I do not at all just now dispute the possibility of there having been a cervical rib; when the patient was examined in the hospital the bony growth or prominence was conjectured to be either an arrest of development of the first rib, or an extension of the transverse process of the last cervical vertebra."

It seems a very remarkable circumstance that the right subclavian artery, which was supported on the malformed rib, should be natural; whereas the left artery, which was placed at the distal extremity of the rib and rested upon a bony process from the rib below, should have undergone the condition in which it was found.[1]

[1] A duplicate plaster cast of the external aspect of the patient during life is

There is another curious feature in my case, viz., the absence of all pulsation in the radial, ulnar, brachial, and axillary, arteries to within an inch of the distal side of the arterial tumour. There was an imperfect supply of blood to the limb, as evidenced by the deficient nutrition, by the sensation of cold, and by the diminished natural heat of the limb which necessitated artificial warmth by the application of flannel envelopes; the muscles likewise were weak and partially wasted, so that the patient was rendered unfit for work. These conditions were due entirely to the want of a proper arterial supply, and yet there was no apparent cause to account for this deficiency; certainly nothing in regard to the aneurismal swelling, as the blood flowed freely through it; there was no exostosis of the first rib pressing upon the artery as met with by Mayo;[1] there was no tumour or glandular swelling to be found anywhere in the course of the artery, as observed by Hodgson,[2] although repeatedly and carefully looked for, and yet there was a total arrest of all pulsation in the vessels of the limb.

If we peruse the recorded cases of subclavian aneurism, we find several instances in which no radial or even brachial pulse existed. Now, although in the majority of aneurisms we find that they more or less interfere with the circulation in the part below, they generally render it more feeble; and when the pulsation in the vessels below ceases, it is because the aneurism has caused pressure on the trunk, or the canal has been blocked up by coagulum. In the present instance, however, there was no obstruction whatever; the aneurism, as is the case with nearly all fusiform aneurisms, was free from coagulum, and contained nothing but fluid blood, which readily passed through it without any obstruction, and the artery some short distance below the

placed in Guy's Hospital museum, as also a copy of the artery drawn after its removal from the body.

[1] Mayo, "Case where the Subclavian was pushed forward by an Exostosis on the first Rib, causing it to simulate an Aneurism, and where the Circulation through the artery was arrested," 'London Med. Journ.,' 1831, vol. ii, p. 40.

[2] Hodgson 'On the Arteries,' p. 262, case 38.

dilatation pulsated as strongly as the portion above it, though this pulsation ceased after the artery had entered the axilla. Thus the presence of the aneurism does not explain the absence of pulsation in the vessels below. We must, therefore, look for some other cause, and this brings us to the second question, viz. the condition of the vessels themselves. This, of course, must be conjectural; is it possible for the arterial vessels to have lost their peculiar property of elasticity, their pulsating and beating, and yet to allow a diminished current of blood to pass through them; thus becoming like veins through whose tubes blood flows without appreciation by the finger? It is possible for such a condition of things to exist, viz. absence of pulsation in, and yet a free although diminished flow of blood through, an arterial vessel altered and deprived of its natural property?

Another view of the cause of the absence of pulsation in the arm is the probable existence of an actual disease in the vessels themselves, viz. a form of chronic arteritis leading to complete obliteration of their tubes. Here we find many circumstances in corroboration, for, on careful perusal of the case, there are evidences of slow and gradual changes having taken place in the limb after an injury to the right index finger about two years ago; the finger became inflamed, and, although it healed in three weeks, to this alone does the man attribute his present state, for after that time he began to suffer occasional pains in the right arm, which gradually became weaker so as to force him to give up work; there was also defective nutrition of the fingers, as evidenced by the condition of the nails, the loss of temperature commencing at the extremities, and at times the almost entire absence of blood in the fingers (especially in the index, which was often perfectly white and blanched), so as to require friction and wrapping in cotton wool to enable blood to reflow into them—all these symptoms, although present in aneurism, yet go far to establish the suggestion of a chronic arteritis and subsequent obliteration of the main trunks. If we turn to page 576 of Mr. Hodgson's work, we find there, recorded in the appendix, a case of obliteration of the

brachial, ulnar, femoral, popliteal, and tibial, arteries, occurring in a gentleman of thirty-six years of age, who after an attack of fever and pleurisy became the subject of this affection, and of which he died very shortly, so that the absence of pulsation in all these vessels was proved to have been caused by obliteration from chronic arteritis.

Mr. Savory[1] has also related the case of a young woman, æt. 22, in whom the main vessels of both upper extremities, and of the left side of the neck, were obliterated throughout by arterial disease, and had degenerated into a fibrous cord.

Might not such be the condition in the present case?

Supposing that this state of things did exist in the man's arteries, was this assumed morbid condition, this blocking up of the vessels as high as the axilla, the cause of the aneurismal dilatation of the third portion of the subclavian artery? Was the force of the heart's impulse, thrown upon this portion of the tube, the cause of its bowing out under the pressure by a kind of *vis a fronte?* This may seem to be a very rational view of the matter, but it is very unusual and not borne out by facts; it did not occur in the two instances just alluded to; and, again, pressure on, or ligature of, an artery does not lead to aneurismal dilatation on the cardiac side of the vessel, even if it have some morbid condition of its coats; if it were so there would be an end to such curative measures as are adopted, for we should be doing no good in thus treating an aneurism, as by getting rid of one aneurism, we should be laying the foundation for another, which in its turn would require a similar treatment and be followed by the same results. Hence, then, I cannot but regard the aneurismal dilatation in the present instance as a purely local disease caused by an atheromatous condition of the vessel, and it would in all probability have increased in size, become diffused, and led to the death of the patient.

On the other hand, there is still the fact that this condition might be a purely dilated artery, like Dr. Robert Adams's case, and have remained *in statu quo* for years without the

[1] 'Med.-Chir. Trans.,' 1856, vol. xxxix, p. 205.

necessity for any interference whatever, but time and observation of the progress of the case could alone have proved this.

There is still one other peculiarity about this case, viz. the condition of the fingers on the affected side; the finger ends were ill-developed and somewhat clubbed in shape, the nails were desquamating and of a darkish colour, whilst the fingers generally were cold and numb. Such a condition occurred in a case of enormous subclavio-axillary aneurism recorded by Dr. J. Ogle in the 'Pathol. Trans.,' vol. x, p. 103.

In this case the report states, "the pulse at the right wrist eventually entirely failed, and the nails of the fingers became exceedingly hypertrophied, becoming much broader and thicker, as well as longer; and the ends of the fingers clubbed in shape, and quite darkly *cyanotic* in colour."

Dr. Ogle remarks, "the peculiar cyanotic character of the fingers of the affected hand along with the increased growth of the nails . . . . I attribute to exalted nutrition induced by the presence of an increased amount of blood in the veins of the part, detained there by the pressure upon and interference with the circulation in the neighbourhood of the axilla. The œdema and want of pulse at the radial artery, in addition to other symptoms, palpably indicate this obstruction."

In these two instances only has this condition been found, and it is probably but an accidental circumstance, for there are numerous cases in which the main channels of the subclavian, axillary, and brachial, vessels have been obstructed without causing any marked changes in the fingers. On the other hand, a clubbed condition of the fingers and a weak circulation are met with in phthisis, and are by some physicians considered to be a sign of the disease. In Dr. Ogle's case the man had hæmoptysis three years before death.

In a case of subclavian aneurism recorded by Langenbeck,[1] he makes mention of a peculiar condition of the finger ends as occurring at the time when a recurrent increase of

[1] Langenbeck, 'Berliner Wochenschrift,' March, 1859, No. 12.

the aneurism took place, after having been quiescent for a period of three years and apparently disposed to subside spontaneously.

We now arrive at the treatment which was carried out in the present case, and this will entail some interesting points for observation and inquiry.

Whatever explanation we might choose to adopt respecting the nature of the aneurism, our attention was mainly directed to relieve the patient's sufferings which were due chiefly to the pressure of the pulsating tumour upon the brachial plexus and its branches. The tumour was quite elastic, contained fluid blood, and was readily emptied by direct pressure as well as by compression of the artery on its cardiac side; there was no coagulum and no prospect of this forming whilst the current of blood passed freely through the vessel. The idea therefore of gaining a deposition of solid material by indirect compression was considered by myself and others as quite unreasonable, not only on account of the difficulty in making pressure and keeping it up for a sufficient length of time, but also by the absence of a sac or any other hindrance whereby a coagulum or a clot could be retained for the filling-up process. It was a question, therefore, whether to leave it alone or to tie the subclavian on the cardiac side of the dilatation close to the external border of the scalenus anticus muscle. After several consultations it was agreed not to subject the man to any risk, but to watch the case, and if the tumour increased in size and threatened rupture, then to adopt such means as might be necessary. However, it was suggested that digital pressure on the cardiac side of the tumour should be tried, inasmuch as there was plenty of space to compress the artery, and there was moreover a capital background in the abnormally placed rib; besides, compression of the artery against the bone could readily be maintained with very little force and without interfering with any nerve.

The plan was agreed to, and the report of the case gives the result. Although the digital compression did not actually obliterate the dilatation, yet it was the means of setting up

the process by which it became eventually blocked up and consolidated into a fibrous cord.

This result fully corroborates the principles laid down by Bellingham[1] many years ago, and demonstrates most fully the justness of the following remark by him, viz., "that the partial current through an aneurismal sac will lead to the deposition of fibrine in its interior, and cause it, within a few hours, to be filled and obstructed, so as no longer to permit of the passage of blood through it."

Such is the result in cases of ordinary aneurism and it can be easily comprehended, but when we consider the fusiform or tubular variety of aneurism, where there is a dilatation of the whole calibre of the artery, we cannot quite so readily bring our minds to regard the process of filling up to be the same.

Mr. Luke[2] has recorded a case of tubular aneurism of the femoral artery in a man, æt. 38, and in this instance the tumour was of an oblong form, extending from Poupart's ligament three or four inches down the thigh. This was treated by direct compression, of sufficient force only to retard the flow of blood through it, and a cure was effected.

Mr. Luke enters into a long dissertation as to the mode in which this was carried out; he believes that the process is not always one of deposition of coagula from the blood, but that the sac itself, or more properly its vessels, are the efficient agents in the fibrinous formation; that instead of growing by deposits on its inner or central surface, the increase must take place upon the exterior surface, which lies in contact with the sac; and he concludes that the action itself by which the vessels deposit the fibrinous secretion is probably of the plastic kind, bearing a certain analogy to the adhesive process in other parts.

Broca[3] has given special attention to the mode in which fusiform aneurisms undergo cure, and premises the subject by elaborately considering the mechanism of the flow of

[1] Bellingham 'On Compression in Aneurism,' p. 127.
[2] Luke, 'Medical Times and Gazette,' 1845, p. 78.
[3] Broca 'On Aneurism,' p. 142.

blood through these dilatations, and the condition of the blood itself; he thus sums up the process of coagulation. "In all this, from the commencement of the diastole to the end of the systole, the blood is completely renewed in the centre of the aneurism, much less in the neighbouring layers, and almost none at all in the peripheral layers; the latter thus becoming in a condition favorable to the coagulation of the fibrin, permits the deposition of active clots (fibrin) in the parietes of the sac, forming the first fibrinous layer in the fusiform aneurisms; similar layers of deposit ensue, and each new deposition narrows the cavity of the sac by degrees until the obliteration is completed."

Le Fort[1] differs in some respects from the views of Broca on the state of the blood and the circulation in the fusiform aneurisms. He refers the formation of a clot to a more or less complete stagnation of the blood, and to the contact of the blood with a structure which is not the internal membrane of the vessel, as must always take place in aneurismal sacs, since in these, rigorously speaking, there is no internal coat. In arterial dilatation, therefore, where the internal membrane exists, the blood has no tendency to coagulate, and at the same time it does not stagnate, but if the internal membrane has disappeared at any point, then clots may be formed in the parietes of the vessel, and these clots are firm and fibrinous. He also adds that inflammation plays a great part in the formation of a clot.

We cannot enter further into this interesting subject; suffice it to say that there are two theories respecting the obliteration of tubular or fusiform aneurisms—the one that it is due to the successive depositions of laminæ or layers of coagulum from within to without, from the blood current to the walls of the sac; and the other that the deposition commences from the external wall, by plastic effusion from the coats of the dilated artery, and probably from their vasa vasorum, and that this effusion by extending inwards ultimately blocks up the vessel.

The main point seems to be, how are we to favour the

[1] Le Fort, 'Dict. Encyclop. des Sciences Médicales,' article "Aneurisme."

obliterating process in fusiform aneurisms? It appears that a very essential condition is a change in the internal lining membrane of the artery. A dilated artery, with a healthy condition of all its coats, is not in a condition favorable to coagulation; in fact, it does not differ from an ordinary arterial tube and may remain in the same state for years, and this is well exemplified by Dr. Adams's case; but should inflammation be set up in the dilatation, or should the internal coat undergo morbid changes, then there may be a prospect of effecting its obliteration, as occurred in the present case.

The discrimination between these two conditions in a vessel is highly important, for in the one instance we should be disposed to leave it alone; but in the other instance, where the dilatation is due to disease of the internal coats, we must endeavour to bring about the obliteration of the vessel, otherwise a regular aneurism may form or the artery may burst, as has happened in many of the examples of subclavian aneurism.

The length of this communication prevents my entering upon the various modes of treatment adopted in subclavian aneurism, and therefore in conclusion I shall only add a few words on the subject of compression of this artery.

Three methods offer themselves, viz.—1st. Pressure on the artery on the cardiac side of the tumour; 2nd. Pressure on the distal side; and 3rd. Pressure directly upon the sac itself; recollecting at the same time that subclavian aneurisms are very frequently of the fusiform variety, and consist in a general dilatation of the whole of the coats; that the contents are fluid, with a want of tendency to clot formation; that they generally retain a small size, and very slowly enlarge; that they most frequently give way either into the neck, or on to the thorax, or into the axilla. Hence, then, caution must be used in adopting compression as a means of cure.

My case is a good example of the 1st method, viz., *pressure on the cardiac side of the aneurism;* but it is very doubtful whether such an extraordinary anatomical disposition of parts will again favour a patient afflicted with

aneurism in this region. Pressure also on the subclavian artery just as it emerges from the scalenus is exceedingly painful and cannot be borne for any length of time.

2nd. *Distal pressure* can only be performed below the clavicle, but so much force is required that it is altogether impracticable, although we have a very interesting example of nature performing this operation herself in a case of subclavian aneurism mentioned by Hodgson. It suggests the idea of the distal operation.

3rd. *Direct pressure* upon the tumour itself; this mode of treatment has been most successfully employed by Mr. F. M. Corner, of Poplar, who has kindly permitted me to present his case to the Fellows of the Society as an appendix. The compression did not require any amount of force, but was made in such a manner as to retard the flow of blood through the aneurism.

The following is an epitome of the examples of the varied methods of compression:

1. Compression on the cardiac side of a subclavian aneurism.
   - *a.* Case related by Beauchène in 'Corvisart, Le Roux, and Boyer's Journal,' quoted by Hodgson at p. 113. In this instance the pressure was produced naturally by the scalenus anticus.
   - *b.* Case related in this communication.

2. Compression on the distal side of the aneurism.
   - *a.* Case related by Hodgson at p. 110, where an aortic aneurism was the cause of compression.
   - *b.* Case related by Auchinloss,[1] where, in a case of aneurism involving the subclavian, carotid, and innominate, arteries, natural pressure on the artery was effected as it passed between the scaleni, which acted like a ligature and obliterated the vessel at this part to the extent of the breadth of the muscles.

[1] Auchinloss, 'Edinb. Med. and Surg. Journ.,' 1836, vol. xlv, p. 338.

3. Compression directly applied on the aneurism itself.

a. Corner's case, as related in the appendix.

b and *c*. Two cases related by Dr. J. M. Warren in his 'Surgical Observations,' where direct compression, with ice and rest, seemed to have given an impetus to the tumour; in the one case producing obliteration of the sac, in the other causing suppurative and destructive inflammation, but ultimately leading to a successful issue.

d. The well-known case recorded by Dr. Yeatman,[1] who invented and used a kind of horse-hair cushion buckled over the tumour by means of straps passed under either axilla; in his case, however, it was a large diffused aneurism which occupied the axilla as well, but the compression was of material service in the process of cure.

I have been permitted to append the notes of an unpublished case which came under the care of Professor Spence, of Edinburgh, and although it does not bear upon the subject of compression, yet it possesses many interesting points for consideration. It is the only case on record in which amputation on the distal side of a large subclavian aneurism has been performed.

[1] Yeatman, 'Med. and Phys. Journ.,' vol. xxxiii, p. 377.

APPENDIX No. 1.

Aneurism of the Right Subclavian Artery, cured by direct Compression, in a man who had undergone a spontaneous cure of a left popliteal aneurism, and in whom also a right popliteal aneurism had been successfully treated by compression on the proximate side.

By F. M. CORNER, Esq.,
SURGEON TO THE POPLAR HOSPITAL.

B. C—, æt. 46, was working as a shipwright in June, 1866, when he noticed a pulsating tumour about the size of a walnut above the right clavicle, for which he could not attribute any cause. The swelling was immediately outside the scalenus muscle and appeared partly overlapped by it; its impulse could not be arrested by pressure on the proximal side of the tumour. It gradually enlarged to the size of a hen's egg, and he complained of pain, coldness, and weakness, of the right arm. These feelings were similar to those experienced by him in his feet and legs when suffering from popliteal aneurisms in 1859 and 1861.

His early history is as follows:—In December, 1859, he applied to me, complaining of swelling and coldness in the left leg and foot, which had existed more than a month. He was a thin, spare man, had never been at sea, had never had syphilis, and had worked steadily as a shipwright. On careful examination no pulsation could be felt in either tibial artery, or in the popliteal, or in the femoral below the giving off of the profunda. He had experienced a pain and stiffness in the *left* popliteal space, where now existed a firm swelling about the size of a nut. He was recommended gentle exercise and friction, which effected but a slow amendment, although the swelling quickly disappeared.

In February, 1861, he again consulted me on account of a swelling in the *right* popliteal space, which he had only noticed a week before. The tumour measured four inches in

length and three inches in breadth. Compression of the femoral artery completely stopped the pulsation in it, and steady pressure removed the swelling.

On March the 5th the following treatment was put into practice. An elastic cotton bandage was lightly applied from the toes to the thigh, and Carte's instrument used alternately at the groin and thigh. His pulse was quiet and very compressible. He was ordered morphia and digitalis three times a day; fish diet and meat were given on alternate days, but no stimulants. The glands in the groin became swollen and tender, so that he could not bear pressure for more than two hours at a time.

On March the 15th there was no deposition in the aneurismal sac. I therefore made use of a common sash-bolt weighing 7 lbs., which, when laid upon the upper end of the artery, so far arrested the current of blood that only occasional and slight pulsation was felt in the swelling. This weight was removed at night and readjusted in the morning, continuing it until 7 p.m.

On March the 18th the foot and leg became suddenly cold and numb; half the aneurism below had become solid, and the tibials had ceased to beat. The pressure by the bolt was now continued for one or two hours only during the day.

On March the 21st the whole of the sac seemed to have become filled, and on April 6th all hardness in the ham had disappeared, but the patient could not walk many miles without feeling his foot cold.

The man followed his usual employment and continued in tolerable health until June, 1866, when he began to suffer much pain about the shoulder-joint, and accidentally discovered a swelling above the clavicle.

In August, 1866, he became an in-patient at St. Thomas's Hospital, and the swelling was pronounced to be one of subclavian aneurism; it was proposed by some that the subclavian artery should be ligatured, but on consultation the operation was negatived.

In January, 1867, he placed himself under my care. The tumour was of the size and shape of a hen's egg, but more

flattened; the contents appeared to be perfectly fluid, and the aneurism seemed to be one of dilatation of all the coats; the long axis of the tumour passed in the direction of the artery. He experienced a sensation of coldness in the arm, which was weak and painful; the pulse was small, soft, and readily compressible. The tumour was close to the scalenus, so that there was no room for pressure on the artery on its cardiac side. The case was seen by Mr. Hutchinson, of the London Hospital, who agreed with me that operative measures should be abandoned, in consequence of the fatality attending ligature of the first portion of the subclavian, and of the innominate artery.

In January, 1867, he was kept in bed and ice was applied over the tumour; it was kept on continuously nearly all day. His diet consisted of animal food and bread, vegetables being withheld. No benefit resulted from this treatment.

In August, 1867, a leather cup was accurately moulded to the swelling above the clavicle and fixed on by straps which passed under each axilla. From this he derived great comfort, experiencing less uneasiness in the part, and feeling much safer when making exertion. He then acted as shipkeeper, avoiding only laborious jobs, and lived as an ordinary working man.

In August, 1868, he felt himself suddenly bad, experiencing sickness and vertigo, so that he was obliged to hold on to something to prevent his falling; and on feeling the swelling afterwards he found no pulsation in it.

On the 15th of this month he was seen by me; there was some slight pulsation to be felt, but the bulk of the swelling was hard.

When again examined on October 26th, neither swelling nor pulsation could be found. A slight impulse existed in the radial and brachial arteries; the temperature of this limb was somewhat lower than that of the opposite. Sensation was perfect, and he had resumed work as a shipwright.

APPENDIX No. 2.

Notes of a case of Subclavian Aneurism, in which Amputation at the Shoulder-joint was performed; recovery. Death four years after, probably from internal aneurism.

By PROFESSOR SPENCE, F.R.S. Ed.,
SURGEON TO THE EDINBURGH ROYAL INFIRMARY.

A man, æt. 33, who was an engineer on board ship and had been long in warm climates, came under the care of Professor Spence suffering from an aneurism of the right subclavian artery. He attributed it to exertions in repairing machinery, but his history was not very distinct. He complained of rheumatismal pains in the right arm which had been of fully two years' duration. The aneurism was detected by a surgeon only shortly before his admission into the hospital.

The tumour occupied the whole of the subclavian triangle, and extended inwards beneath the sterno-mastoid muscle. The innominate artery and the aorta appeared to be healthy. The aneurism was fusiform, its contents completely fluid, and there seemed to be no tendency to coagulate. There was rather more pulsation than usual under the pectoral muscles below the clavicles.

Condition of the limb.—Circulation much impaired, the radial pulse almost imperceptible; the hand and part of the forearm were purple and mottled, and the arm œdematous —in fact, threatening gangrene.

Sensation.—Excruciating pains in the arm, but the hand was numbed, and there was scarcely any sensation in the little or ring fingers. The muscles were not wasted, but the agonizing pain and the swelling of the arm prevented voluntary motion, although there were cramps and spasms at night.

Treatment.—The choice lay between ligature of the innominate artery and amputation at the shoulder-joint. Taking into

consideration the hitherto fatal results of the former operation and the state of the arm, I preferred amputation, as combining the effect of Brasdor's method with the removal of the *vis a fronte*, the attractive power of tissues to be supplied by the circulation; and I hoped that when the parts which the vessel supplied with blood were removed, it would gradually contract and the blood be directed into other channels.

Another method was suggested, viz., opening the sac after having controlled the circulation through the innominate, on the principle advocated and carried out by Mr. Syme in axillary aneurism, but I rejected it as quite unsuitable here, since the vertebral circulation into the sac could not be commanded by compressing the innominate, and moreover the ligature on the cardiac side of the sac would have been close upon the vertebral, thyroid axis, and internal mammary, arteries, even supposing that the coats of the vessel were healthy.

Amputation was performed on the 6th of April, 1864.

The immediate results promised a complete success; for the first ten days the tumour was scarcely to be felt, but no coagulation occurred. When he left the hospital the aneurism was feeble in its pulsation, and it had diminished to about one third of its original size; there was little coagulation, however, and to favour this he was directed to use the iodide of potassium.

He died in the course of the summer of 1868, but I have not been able to ascertain the exact cause of death. I suspect there was no post-mortem examination. I had heard incidentally, some time before his death, that the aneurism had increased towards the chest; probably the innominate and aorta had also become involved.

A CASE

OF

DOUBLE ANEURISM

AFFECTING THE

RIGHT EXTERNAL ILIAC AND FEMORAL, AND THE RIGHT POPLITEAL, ARTERIES,

CURED BY

PRESSURE UPON THE COMMON ILIAC AND THE FEMORAL ARTERIES.

BY

JOHN HILTON, F.R.S.,

SURGEON-EXTRAORDINARY TO H.M. THE QUEEN; SURGEON TO, AND LECTURER ON CLINICAL SURGERY AT, GUY'S HOSPITAL.

Received April 2nd.—Read June 22nd, 1869.

J. C—, æt. 45, was admitted into Luke Ward, Guy's Hospital, on October 15th, 1868. He was a carpenter, living at Chelmsford, and had always been a steady man, accustomed to hard work. He said that nearly two years since he first noticed a swelling about the size of a pea in the right groin, which gave him neither pain nor inconvenience; about nine months ago he felt a tumour of small size in the right popliteal space, but it caused him no discomfort until recently, when, after a day's work, the right leg became stiff, so that he could not properly extend it; in the morning,

however, the leg was as strong as usual, and he was able to do his usual work. He has been accustomed to walk long distances, and about once a week as much as thirty miles in the day; this he has done more or less regularly for the last nineteen years.

On Admission.—He was a strong, well-developed man; his muscles, however, were wanting in tone, and he had arcus senilis of both corneæ.

At the upper part of the right thigh, situated about an inch and a half below Poupart's ligament, and two inches from the spine of the pubes, was a pulsating tumour by which the skin was very slightly raised. It measured rather more than two inches in the long diameter (which was from above downwards), and one inch and a half in the transverse. Manipulation proved that this aneurism extended also about two inches above Poupart's ligament into the right iliac fossa. The pulsation was very forcible, and was increased by the patient assuming the erect posture. In the right popliteal region there was also a pulsating tumour which was softer than that in the groin, and the pulsation more apparent; it was oblong rather than globular, and uneven to the touch; it measured three inches in the long diameter, and two and a half transversely.

There was no murmur or bruit audible over either aneurism; hence it was concluded that they were aneurisms by dilatation. When that in the popliteal space was emptied by compressing the femoral artery, the tumour could scarcely be felt. There was œdema of the limb and, although the foot sometimes felt colder than natural, it was quite free from pain.

The patient was rigidly confined to bed, with the limb placed in an easy position, flexed, and supported on a pillow. Full diet was given and, as he was restless, an opiate mixture ordered.

On the 27th the tumours appeared to be somewhat more solid, and a mixture, containing twenty drops of tincture of digitalis with thirty of tincture of iron, was given every six hours, and on November 2nd every four hours. This was,

however, discontinued on the 19th in consequence of a severe catarrhal attack.

On December 7th, as there was but little alteration in the condition of the tumours, I examined him carefully and found that, although the abdomen was somewhat prominent, yet by careful manipulation the right common iliac artery could be felt pulsating about two inches below the umbilicus and half an inch from the median line. At this spot the vessel could be completely compressed without in any way interfering with the pulsation of the left common iliac artery. I therefore directed that a purgative should be given to the patient, and that he should be kept on spoon diet until the 10th, on which day chloroform was to be administered, and a tourniquet applied over the right common iliac artery, and kept on for about five hours.

The point of intended pressure by the tourniquet was accurately marked by the application of nitrate of silver.

I clearly ascertained by digital pressure that without chloroform the patient could not bear complete compression of the common iliac artery even for one minute.

The man was now in good health and expressed himself ready to undergo any operation for his benefit.

10th.—At 10 a.m. chloroform was administered by means of Junker's apparatus, and the patient was under its influence in ten minutes. At 10.45 the tourniquet pad was screwed upon the right common iliac artery, and at 11 o'clock all pulsation in the right iliac and femoral arteries had completely stopped. He was kept under the influence of chloroform, administered by the two house-surgeons, Messrs. Sells and Rendle, until 5 p.m., when it was discontinued, in accordance with my previous desire. Four or five times during its compression the artery slipped from beneath the pad of the tourniquet, and pulsation became again apparent in both aneurisms; but on each occasion the tourniquet was quickly and effectually readjusted. The patient's limb was covered with cotton wool and lightly bandaged during the whole period of pressure. At 5 p.m. the chloroform and tourniquet were both withdrawn. Both

aneurisms seemed slightly harder, yet the pulsation was apparently as distinct as before the application of the tourniquet. About 6 p.m. he was quite conscious and said that he felt "all right."

11th.—He seemed very well, except that he had slight frontal headache and no appetite. There was no pain, except a little soreness on pressure upon the surface of the abdomen, where the pad of the tourniquet had been placed. He was ordered to take beef-tea and milk diet. He had some little difficulty in passing water.

18th.—Has been going on well since the last report, but there was no improvement in either aneurism. The bowels were opened to-day for the first time by an injection, and he was allowed to return to his usual diet.

21st.—After a careful examination of the patient I desired that chloroform should again be given to him, and the tourniquet applied over the right common iliac artery, and that another screw tourniquet should, at the same time, be placed on the femoral artery; these measures to be persevered with until it was ascertained that all pulsation had ceased in both aneurisms.

22nd.—The patient's bowels having been freely opened the previous day, chloroform was again administered by the house-surgeons, in the same manner as before, at 10.10 a.m. At 10.30 the patient was under its influence, and a screw tourniquet was placed upon the abdomen over the right common iliac artery. Another screw tourniquet was also fixed over the femoral artery at the apex of Scarpa's triangle; this having been screwed down, all pulsation ceased in the popliteal aneurism. The large upper tourniquet was now screwed down on the common iliac, and pulsation was stopped in the ilio-femoral aneurism at 10.40 a.m. During the day this tourniquet had to be rectified about twelve times, because slight pulsation was observed in the upper aneurism.

At 4.40 p.m. both tourniquets were removed: there was not the slightest pulsation in the popliteal aneurism, and it was hard. The upper aneurism also felt firmer, but there

was distinct, although feeble, pulsation in it. The pulse at the wrist was good, 72.

At 6.30 p.m. the tourniquet on the common iliac artery was again removed, but slight pulsation was still manifest in the tumour. Both tourniquets were immediately re-applied, and the pulsation stopped. The left femoral artery was beating vigorously, and had done so throughout the day. The conjunctiva had been kept continuously just insensible. The patient's respirations had varied considerably; at one time they were tolerably strong, at another hardly perceptible. The pulse had kept at about 72; it had, however, varied greatly in force.

At 8 p.m. both tourniquets were removed; and no pulsation could be detected in either the ilio-femoral or the popliteal aneurism; the chloroform was accordingly stopped. The right limb was not so warm as the left. Nearly two pints of clear urine were drawn off by the catheter.

23rd.—No pulsation could be discovered in either the femoral or popliteal artery, whilst both aneurisms had a feeling of solidity. The right foot (which was invested in cotton wool) was cooler than the other, but not cold, and the patient said that it felt somewhat numb. The tongue was swollen, so that he could neither speak nor swallow well; this was caused by the tongue forceps. He had taken some ice and milk only.

In the evening I found the temperature so low, and the sensation so imperfect, in the right foot, that I directed the whole extremity to be wrapped in oiled lint and cotton wool, and a hot bottle to be placed near the foot. An ounce of brandy was ordered to be given every four hours.

24th.—His pulse was 72, and he felt comfortable. The foot was rather cold and numb; slight pressure upon it caused pain, yet he could recognise a touch on any part of its surface. As he was very restless last night, a subcutaneous injection of gr. $\frac{1}{3}$ of morphia was ordered.

25th.—Nearly three pints of urine were drawn off from his bladder. He had great pain in the foot, but not confined to any definite part, which had made him very

restless during the night, although four morphia injections of gr. $\frac{1}{4}$ each had been given to him. These had diminished the pain in the foot, but, nevertheless, he had hardly any sleep.

26th.—Had slept but little, the pain in the foot being constant, and most marked about the ankle. His diet was bread and milk, with some brandy. He had an injection of morphia last night.

27th.—There was still considerable pain in the foot, and he could not move it freely. Two injections of morphia were given last night. There was no pain in the abdomen or thigh. He had taken a chop and some beef-tea.

28th.—He could not sleep without a morphia injection. The foot and leg were still very tender, but although he had great pain occasionally in the foot, its sensation was perfect, and he could move it in all directions. Temperature 5° higher than on the other side.

29th.—He suffered much pain in the foot last night, but had been nearly free to-day, although slight pressure upon it caused pain. The limb was still invested in cotton wool. Bowels freely open spontaneously.

February 5th.—His general health had improved, and he had gained flesh. His appetite was good, and he could sleep well. The tenderness over the whole of his right lower extremity still continued, but it was less than formerly, although pain, increased upon pressure, was felt about the instep and knee. Ordered—Quiniæ, gr. iij; Liq. Opii Sedativ., ℥xv; Inf. Rosæ Comp., ℥j ter die.

17th.—The medicine had relieved the aching pain in the knee and ankle, but the leg was still more than normally sensitive. He could place some weight upon it, but not that of his whole body.

20th.—The circumference of the right thigh, taken eight inches below the anterior superior spinous process of the ilium, was fifteen inches; that of the left in the corresponding position seventeen and a half inches. For the last week he had been able to sit up in the ward during the greater part of the day.

March 8th.—He managed, with some help, to walk downstairs. The measurements of the two thighs were unaltered.

16th.—His general health was good. He felt stronger, was eating and sleeping well, and was very desirous to go home.

The ilio-femoral aneurism in the groin could now be felt as a fibrous band about three quarters of an inch broad, deeply situated and ill-defined. That in the popliteal space was rather larger (about an inch in breadth) and more distinct. They were both much less than they were six weeks ago. There was no pulsation in them, nor could any be detected about the right lower extremity. He could extend the thigh perfectly, but not the knee, and he stated that he was prevented doing so by the remains of the popliteal aneurism.

The foot and leg were warm, and the tenderness in them had almost ceased. There was no œdema even after the limb had been allowed to hang down. He complained of occasional pain through the ankle and the head of the tibia, especially at night. He could not yet support the weight of his body on the leg, and the difference in the size of the two legs still continued, the circumference of the right calf being eleven inches, whilst that of the left was twelve and three quarter inches.

April 2nd.—A note from the patient, residing at Chelmsford, reported him well, except that he had painful sensations occasionally in his leg and foot.

A CASE

OF

ANEURISM OF THE FEMORAL ARTERY

TREATED BY

LONG CONTINUED COMPRESSION OF THE COMMON ILIAC;

WITH REMARKS.

BY

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Received April 7th.—Read June 22nd, 1869.

THE man, a carpenter, forty-one years old, was admitted into Guy's Hospital under my care on the 5th of February, 1869. He had wandered about the provinces in pursuit of work, his recognised abode being Vauxhall. He had been a hard-working man, although much addicted to intemperance and other irregularities at intervals, as circumstances enabled him to indulge in excesses; he had once shown signs of delirium potatorum. He was of middle stature, with a well-formed thorax, but his muscles were not firm, and his facial aspect indicated the wear and tear of many more years than he had actually passed through. The

surface of his body was pallid, and sufficiently inclining to a yellow tinge to be termed jaundiced, although bile was not detected in the urine; this was high coloured and free from albumen. His pulse was weak, of normal frequency under repose, but easily excited. No organic disease of the heart could be discovered. His mother was living and well, aged fifty-eight years; his father died at sixty-four. The man had evidently inherited a good constitution, which had been abused by intemperate habits, although it had not been injured by any serious illness.

I have thus minutely described the constitutional condition of the patient at the moment of admission for the treatment of the local complaint, and also his personal history, because the termination of the case was probably hastened by the facts above related; and because the state of the blood may have been one cause why such slight progress was made in the arrest of the aneurismal tumour, as will hereafter be narrated.

I shall now describe the local complaint. On the 12th of January, 1869, twenty-four days before admission, whilst walking quickly, he suddenly felt a sensation in his left groin, which he describes as "a bursting of a vein." He had not been previously exerting himself in any way, nor was he given to active walking. For eighteen days subsequently he thought himself quite well, but on the 30th he noticed a swelling in the left groin, and that it "throbbed;" it became very painful, so that he was unable to work, and he could neither eat nor sleep.

There was a pulsating tumour of a triangular shape, with its base above corresponding to the line of Poupart's ligament, and its two sides in relation with the sartorius and adductor longus muscles in the upper third of the left thigh. It extended over the spine of the pubis and to within an inch of the anterior superior spinous process of the ilium, but it did not appear to pass into the iliac fossa. The peculiar dilatation of the sac at each contraction of the left ventricle was very marked, as well as a thrill perceptible both to the hand and ear at the same time. The current of blood in

traversing the sac likewise produced an audible sound. Pressure on and above it caused much pain, a circumstance which rendered it almost impossible to arrest the current of blood entirely; when, however, this was accomplished, the tumour was but slightly reduced in size, and it led to the inference that the contents of the sac were mostly solid. The limb below the tumour was slightly œdematous.

General constitutional treatment was ordered, absolute repose enjoined, and a nourishing diet allowed, with tonics. The leg was slightly elevated and cold applied to the tumour.

February 7th.—Two days after admission, as the tumour was painful, and had not diminished by the rest, position, and application of cold, the first attempt to arrest its pulsation completely by pressure was commenced at 11.32 a.m. and continued until 8 p.m.; that is to say, for about eight hours and a half. The pressure was made by means of a tourniquet upon the common iliac artery, and compression of the femoral below the tumour was likewise made. The man was unconscious the whole of the time. Junker's apparatus was used in the consumption of 57 drachms of chloroform. Very slight change took place in the tumour during this long time, and at its conclusion, when the pressure was taken off the iliac artery, the sac pulsated as strongly as ever. During the eight hours the pulse never rose higher than 112 beats, nor fell below 90. Trifling variations in the number of pulsations occurred at irregular intervals during the time. He vomited once a few drachms of clear fluid, and at times he was restless.

8th, noon.—There was slight nausea and depression from the effects of the chloroform. His tongue was coated with a thick brown fur, but he took food. Pulse 104.

15th.—The aneurismal tumour pulsated quite as strongly as on admission, and had become slightly larger during the last seven days. At 11.5 p.m. he was again brought under the influence of chloroform, and pressure was made as before on the common iliac artery, which entirely arrested the

passage of blood through that vessel. Unconsciousness and pressure were maintained until 8.15 a.m. of the 16th, or for nine hours and ten minutes; but at the expiration of that time no progress had been made towards the cure of the disease; 46 drachms of chloroform were used. In the afternoon he was still very drowsy. There was slight ecchymosis in the abdominal walls at the site of the pressure.

17th.—The day after the inhalation of the chloroform he complained of pain in the foot and dulness in sensation, it was therefore enveloped in cotton wool. He slept last night; pulse 92. Appetite good. Anxiety of countenance rather increased.

18th.—Complained of pain in the foot, but it was warm, and no untoward change had taken place. He ate food without difficulty, and slept fairly. Pulse 96. Tumour unchanged.

22nd.—Spoke of a painful sensation, as of burning, over the tumour, which had not, however, undergone any manifest change. Appetite good; pulse 84. He had slept badly, even after a subcutaneous injection of morphia.

25th.—Again submitted to the influence of chloroform, and pressure upon the iliac artery was carefully maintained from 10.20 a.m. to 8.40 p.m., or for ten hours and twenty minutes, without intermission; 44 drachms of chloroform were consumed. The pupils were contracted during the whole time; respirations 32 in a minute, and they varied very slightly; the pulse fluctuated between 100 and 150. He did not vomit. The results at the end of this time were not more satisfactory than on the former occasions, for after removal of the tourniquet the tumour pulsated as strongly as ever. It may be here stated that Mr. Richard Rendle, the house-surgeon, and Mr. Mallam, the dresser, attended to the treatment most assiduously upon each occasion.

26th.—In the morning he was sleeping heavily. At 3 p.m. he was low and drowsy, but sensible when aroused; pulse 122, compressible, jerking; respirations 43; temperature 100·5; circulation much enfeebled.

27th.—His powers were lower; pulse 140, weaker; temperature 102. He expectorates dingy, rusty sputum. There was deficient resonance on the left side of the chest in front, and tubular respiration with slight crepitation. The surface of the body was generally yellow.

He became gradually weaker after this date, and died on March 3rd, having survived the last administration of chloroform nearly nine days.

I have confined the report to a detail of the symptoms of the disease, the effects of the prolonged inhalation of chloroform, and the results of the continued pressure on the aneurismal tumour. But I may briefly state that the condition of the general health was carefully watched; that tonics, sedatives, and stimuli, were administered, and that all kinds of food likely to suit his wants were carefully selected for him and duly given.

Necropsy.—The following description is from notes by Dr. Moxon. The surface of the body generally was yellow. In the abdominal integuments, at the spot where pressure had been made with the pad of the tourniquet, there was slight ecchymosis and infiltration of inflammatory deposit, but no suppuration.

The cerebral arachnoid was rather more thick than usual, and liquid had accumulated beneath it. The brain itself was wasted.

The upper lobe of the left lung was uniformly infiltrated with pus, which came away from it without pressure. This was pure pus when examined under the microscope. The upper half of the lower lobe was in an earlier state of the same condition, the colour red and grey finely mingled, and pus came away on pressure, even in parts where the change was earliest.

The upper lobe of the right lung was covered with lymph, but there was no effusion into the pleura; it was everywhere crepitant, and greenish from early decomposition of blood.

The heart weighed ten ounces, and was of normal size. The right cavities contained tough fleshy fibrine, but there

was no correspondence between it and the state of the exudation in the lung. The tissues of the right side were rather flaccid. Both coronary arteries healthy. The left side contained a small quantity of black clot.

The ascending aorta, its arch, and thoracic portion, were much disfigured with endarteritis in the caseous stage; rounded elevations, about three quarters of an inch in diameter, and about one tenth of an inch in prominence, being very numerous.

On the sigmoid flexure of the colon there was a little lymph. The colon and rectum contained much fæcal matter.

The liver weighed sixty-four ounces; its size normal.

Both kidneys were coarse and large.

The aneurismal sac, which I dissected myself, was situated along the outer border of the left external iliac and femoral arteries. Consequently, it occupied the lower portion of the iliac fossa, and extended higher and deeper over the brim of the pelvis than could be felt during life. The external iliac artery for about its lower half was very firmly adherent to the tumour, so much so that the adhesions would have offered great resistance to the passage of a ligature around the vessel. Besides this the lymph-vessels and glands of the region were firmly united together by old inflammatory adhesions and formed a leathery covering to the sac and artery. The dissection required to prepare the specimen for a drawing of course precluded the retention of these coverings and adhesions.

The division of the sac below Poupart's ligament, which was larger than that above it, burrowed deeply amongst the muscles of the upper third of the thigh; indeed, around the base of the trochanter minor, the femur was slightly roughened by its pressure. Branches of the anterior crural nerves traversed the outer border of the tumour. Doubtless the stretching to which those trunks were subjected will explain the pain complained of in the course of the distribution of their peripheral filaments. The external

circumflex artery neatly bounded the inferior and outer border of the sac.

The general outline of the tumour was ovoid. The sac was formed but little at the expense of the tissues composing the outer wall of the arterial trunk, but by the neighbouring structures. Yet the tissues of the artery were perfectly intact and distinctly defined as they traversed the inner border of the tumour, and did not differ in appearance from those of the trunk of the vessel above and below the disease.

The contents of the aneurismal sac were fibrine and coagula. The clotted blood, which had gravitated to its posterior region, was in large quantity, very soft, almost semi-fluid, scarcely retaining any form, and very black; these were post-mortem coagula. There was much laminated fibrinous deposit strengthening the superficial or cutaneous parietes of the aneurism; and a rounded, irregular deposit of it, having a shaggy surface, projected from the margins of the walls close to the aperture through which the blood flowed into the sac, and especially from the anterior one. Such indications were sufficient to show that an attempt to repair the rent, and to obstruct the circulation of blood through the sac, had been made. Those fibrinous formations which were situated superficially could be felt during life. The hole by which the blood entered the sac was oblong, sharply defined, and about three quarters of an inch in its longest axis. Described with accuracy, it was in the outer wall of the femoral artery, immediately below Poupart's ligament.

Remarks.—The history of this case affords abundant evidence that the patient, although actually in the prime of life, and with the inheritance of a robust constitution, had become prematurely aged and functionally weakened by indulgence in depraved habits and the consequences of a vagabond mode of living. At the time of his admission into Guy's Hospital he was slightly jaundiced; the heart was readily excited to increased action; the nervous system

was depressed; the powers of nutrition were defective; and the blood was in an unhealthy state.

The aneurism was believed to be of short duration, as observation was attracted to the disease, for the first time, only twenty-four days before the man came to seek surgical treatment, and the pulsation had been felt for six days only. But the tumour was large, and at some parts of it there was much solid matter formed; it therefore was not unreasonable to assume that the disease was probably of longer standing than its history might at first sight induce one to conclude. The post-mortem examination also favoured this view. It is even open to the suggestion that the "bursting of the vein" (to use the sufferer's own words), the sensation which first attracted his notice, was caused by the tearing of the posterior wall of the already formed aneurismal sac, when forcibly distended by the pressure of its fluid contents. Before this had taken place the tumour would not be large, and being situated only on the outer side of the femoral artery the blood flowed readily into and out of it. But so soon as the tumour had burst at its posterior part the blood would fill a space, the deeper parts of which must lie considerably below the plane of the main channel of the diseased arterial trunk; and as that fluid gravitated among the femoral muscles, the size of the tumour would not be so much affected on arresting the flow of blood through it, as commonly happens. Thus the intermuscular division of the sac retained the blood, whilst the more superficial part was felt forming the solid tumour in the inguinal region.

In the treatment of this case I rejected all the operations requiring incisions and necessitating loss of blood, for reasons it is idle to mention here. The successful issue of Mr. Hilton's case induced me to select the treatment adopted, considering that it was the safest under all circumstances. The untoward results obtained in this case do not, however, impugn the advantages of the treatment employed, for the prolonged inhalation of chloroform vapour did not injuriously influence the health of the man upon

the two occasions when it was used for eight hours and a half, and nine hours, an interval of eight days having elapsed between each occasion.

It may certainly be suggested that the fatal illness commenced very soon after the third inhalation, and I admit it is possible that the pulmonary disease may have been excited by the chloroform vapour; yet it requires more evidence, I think, before the fact is finally accepted.

The aneurismal tumour was not of the fusiform variety, but it was developed amongst the neighbouring tissues, and its interior communicated with the calibre of the femoral artery by a clear breach in the coats of that vessel. The quantity of fibrine found in the sac after death admits of the inference that, had the man survived a longer time, the sac would eventually have become entirely filled with it, and the disease cured. The want of it at last in sufficient and larger quantity must be attributed to the unhealthful state of the blood and partly to the size of the sac.

A drawing representing the recent dissection of the aneurism, and the preparation itself, are in the museum of Guy's Hospital.

ON

TRANSVERSE FRACTURES OF THE PATELLA.

BY

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Received May 17th.—Read June 22nd, 1869.

For some years fractures of the patella have claimed my especial attention, on account of certain features which seem to me to have been somewhat misunderstood. I have had large opportunities for examining them, and have done my best to follow up my cases until their final results became known. Some errors have, I think, become current owing to the result being recorded at much too early a date, and more especially has this been the case as regards "bony union."

On the other hand we are liable to mistakes if we venture to found opinions on museum specimens, to which no life history is attached. My aim has been to connect the circumstances observed in the early stages of these injuries with the conditions discovered in the patient's after-life, or revealed by post-mortem dissection, and thus to get a complete view of the whole case.

With a view to conciseness I have stated my conclusions in a series of propositions. Some of these only express the

general creed of surgeons, whilst others more or less differ from it.

PROP. I.—For the purposes of clinical discussion fractures of the patella may be conveniently divided into those in which separation between an upper and lower fragment is possible, and those in which it cannot occur.

PROP. II.—The cases in which no separation of a distal and proximal fragment is possible, are much fewer in number than the others, with which they have scarcely any feature in common.

In this group we count cases of vertical fracture (probably very rare); those cases of starred fracture from blows in which no mobility is possible, and in which probably the articular surface of the bone is not involved; and the not infrequent cases in which fragments of greater or less size are broken off from the borders of the bone.

In none of these can any important questions of treatment arise, it being clear that the limb should be kept at rest, and probable that in many instances bony union will result.

PROP. III.—The cases in which separation between the upper and lower fragments is possible, are common, and occur especially in adults who follow laborious occupations.

PROP. IV.—The line of fracture is usually transverse or nearly so, and often near the middle. If one fragment be larger than the other, it will probably be the upper one. Sometimes the lower one is very small. In a few cases the bone is broken into three or more fragments.

PROP. V.—These transverse fractures are not infrequently caused by muscular contraction alone.

PROP. VI.—In the numerous cases in which direct violence is applied to the bone at the moment of fracture, there is almost always muscular contraction simultaneously present, and it is impossible to say which takes the chief share in the result.

The patella probably never breaks transversely except when the knee is more or less bent, and the bone balanced as a lever on the condyles of the femur. Sudden and unexpected flexion, or the necessity to prevent such, is more likely to break it than extreme flexion. The position of the fracture may serve roughly to indicate the degree of flexion existing at the time the fracture happened. If the fracture is very low down, probably the knee was but little bent, and thus the greater part of the bone still resting on the condyles. I have met with not a few cases in which, as far as the patient's knowledge went, no violence whatever was received on the bone at the time of fracture. In a majority, however, there is a history of the knee having been struck against something during the fall.

PROP. VII.—If the bone is broken by direct violence at a time when the muscle is not in action, there will be no material separation of the fragments either at the time or subsequently; and the probability is very great that the line of fracture will not be transverse.

Unless the bone be held firmly as a lever by the muscles at the time it receives the blow, there is no reason why the fracture should cross the bone transversely, and the probability is that it would be starred. The fact that most fractures are transverse is therefore an argument in favour of the current belief that muscular action is a main agent in causing them. The fact that direct violence under such circumstances cannot possibly rupture the strong fibrous structures by which the bone is everywhere surrounded, explains the circumstance that no subsequent separation is likely to occur.

PROP. VIII.—The existence of a wide separation proves that the muscle was in vigorous contraction at the time the bone was broken, and also that the fibrous structures have been extensively lacerated.

The fibrous structures at the sides of the patella are especially strong and are firmly united with it. To admit

of wide separation there must necessarily be a considerable laceration into the front of the joint. Such laceration is possible only at the time of the accident.

PROP. IX.—In all cases of transverse fracture involving the whole thickness of the bone, the knee-joint is necessarily implicated, and it is probable that blood will find its way into the joint, and that synovitis with effusion will follow.

The quantity of blood in the joint is probably often very small, but in severe cases it may be considerable. In one case under my observation it distended the joint, and it was necessary ultimately to evacuate it by incision. The effusion of synovia is an almost constant result, and is, I believe, a very important complication of the case.

PROP. X.—There is no persistent contraction of the quadriceps extensor, or of any part of it, after transverse fracture with separation. When the spasmodic effort which attended the fracture ceases, the muscle usually remains completely and permanently at rest.

My experience has invariably been to find the front of the thigh soft and flabby, the quadriceps being quite at rest. I have scarcely ever known the muscle pass into spasm during examination, but in reference to this remark I must state that it does not apply to the first few hours after the accident, respecting which my knowledge is very limited.

PROP. XI.—The subject of a transverse fracture of the patella is usually quite unable by volition to put the muscle into action, and there is no reason to believe that the muscle is liable to attacks of accidental spasm.

If you ask a man with a recently broken knee-cap to try to lift his limb from the bed, he will reply helplessly, "I cannot;" if you urge him he will get emphatic and

declare, "Sir, I couldn't do it if you gave me the world," but all the time his quadriceps will make not the slightest movement.

PROP. XII.—After transverse fracture with separation, the fragments become of course widely parted if the knee be bent. If, however, the knee be kept straight, their relative position will not be in the least altered by lifting the limb from the couch and elevating it at right angles with the trunk.

The degree of separation produced by bending the knee after transverse fracture varies considerably in different cases. In some the upper fragment does not follow downwards at all, owing probably to extensive laceration in the fibrous structures. In others, although the fragments are quite movable laterally, there is scarcely any gaping in flexion. The experiment is not one which it is wise to try often, nor except with the utmost gentleness. It is not justifiable except in the earliest stage.

PROP. XIII.—The bringing down of the upper fragment is not as a rule in the least facilitated by the common practice of elevating the limb.

In an uninjured limb at rest in the straight position the patella can be moved upwards or downwards for about three fourths of an inch, the ligamentum patellæ restricting its movement upwards, and the fascia preventing its further passage downwards, whilst the rectus muscle remains perfectly flaccid and offers no sort of impediment. Exactly the same condition of things is met with after transverse fracture. I have tried the experiment of lifting the limb dozens of times, and with great care, but never found the upper fragment to alter in position in the least. Care must of course be taken to make the movements gently, and not to let the knee bend. For years I have never treated fractures of the patella except in the longitudinal position.

PROP. XIV.—The causes of difficulty in bringing the upper fragment down are several.

1st.—Effusion into the joint lifting the fragments apart.

2nd. Swelling of the torn soft tissues.

3rd. Contraction of the fibrous structures (chiefly met with when the fragments have been pushed apart by swelling which has lasted for some considerable time).

4th. The difficulty there is in getting well hold of the upper fragment, especially when much swelling is present.

Of these probably by far the most constant and the most efficient cause is effusion into the joint. If you examine a case in which there is little or no effusion, there will be little or no difficulty in bringing the fragments close together. In such cases also it is probable that the laceration is but slight, for the laceration, and the effusion which results, will usually be in relation.

The effect of distension of the joint from within in lifting apart the fragments can easily be imagined, and no doubt effusion into the cellular tissue, between the layers of fascia, &c., will do something towards making the parts rigid, and thus in preventing approximation.

In proportion to the external swelling is the difficulty of getting external pressure, whether manual or by pads, to act efficiently on the upper fragment. The influence of pressure on the sides of the distended joint in making the fluid bulge upwards into the laceration must never be forgotten.

PROP. XV.—In the majority of cases it is easy to force the fragments close and thus obtain crepitus.

PROP. XVI.—The difficulty of securing them in apposition will be exactly in proportion to the amount and duration of the swelling.

I have found much less difficulty in pressing the fragments together, so as to produce crepitus, than books would

lead us to expect. If difficulty has occurred, it has been from the swelling.

PROP. XVII.—The muscle scarcely ever offers any impediment to the approximation of the fragments.

I do not recollect a single case in which, after the first day or two, even forcible pressure on the upper fragment excited any degree of muscular contraction.

PROP. XVIII.—No proof has yet been afforded that transverse fractures of the patella with considerable separation at the time ever unite by bone.

The only proof which we ought to accept on this point is the section of a specimen concerning which the history is definite. There may be such, but I do not know where to refer to them.

PROP. XIX.—It is quite impossible on the living subject to ascertain whether or not bony union has occurred.

In many of my cases at the time of the patient's discharge from the hospital, the fragments were so firmly bound together that I could not produce the slightest lateral movement. In one or two of such cases I have found, by the subsequent stretching of the uniting medium, that it certainly was not bone. A specimen in the London Hospital museum shows such close union, that without section it would have been impossible to say that it was not bone.

PROP. XX.—Transverse fractures with separation may have several different events.

1st. and best.—Close and permanent union of the fragments by fibrous tissue, so that no movement whatever can be detected, and so that section of the bone is needed to show that it is not true bony union.

2nd.—Union by a short and strong ligament.

3rd.—Union by a long ligamentous band which may stretch indefinitely.

4th.—Entire absence of any uniting medium between the bones; the fibrous capsule of the joint, bursa, &c., being the only means of connection.

After six weeks' rest and ordinarily careful treatment by back-splint and strapping, it is, I think, easy to obtain close and firm union, in a fourth or even a third of the cases. In another third the union will be close and strong, but still, on forcible pressure, permitting of slight lateral movement, whilst in the remainder union will be weak and with some persisting separation. In the worst cases the separation ought not at this period to be more than a quarter of an inch.

All statements of results made at the date of the patient's leaving the hospital are utterly untrustworthy, for in some of the best cases the uniting medium will afterwards stretch. The real result is not known until the patient has been allowed to walk about and bend his knee. A year's interval, at least, ought to be allowed, and even after this it is possible that the fragments may become much more distant.

The assertion that non-union, or membranous union, is a frequent result is, I think, a fallacy.

In all the cases that I have examined at the expiration of treatment, there has been reason to believe that the fragments were connected by a fairly thick uniting medium. Thus they could not be separated beyond a certain length, nor could much lateral movement be produced.

The specimens so common in our museums of wide separation, and in which the thickened capsule, bursa, &c., are the only connecting structures, are, I suspect, from cases in which premature flexion had been permitted, and the new material stretched until practically lost.

PROP. XXI.—The chance of the best result is greatest in cases in which but little swelling is present, and the fragments are easily approximated; but it by no means always follows that, in cases in which the fragments easily lie quite close, firm union will result.

PROP. XXII.—The causes of weak union, or of non-union, are probably two.

1st. The fact that the fragments are usually at some little distance from each other during the first week or two of treatment.

2nd. That the space between the fragments is occupied by a fluid secretion (synovia).

Synovitis is an almost invariable consequence of transverse fractures of any degree of severity, and its effusion usually lasts ten days or a fortnight. During this period approximation is difficult and in many cases cannot be attempted.

Without attributing any special effect to synovia, as synovia, in preventing union, it can easily be understood that the presence of any fluid between the ends of a fractured bone must tend in a most important manner to prevent the consolidation of new material. It will supply a menstruum in which the lymph-cells may be washed away and the plasma dissolved.

PROP. XXIII.—Amongst the causes which help to make actual bony union so exceedingly infrequent, it is, perhaps, fair to suggest that the patella differs from most other bones in having periosteal fibres on one surface only, and that from the direction in which the fracture-force is always applied, all those fibres must invariably be ruptured.

PROP. XXIV.—The objects to be attended to during the treatment are—

1st. To keep the knee straight.

2nd. To get rid, as quickly as possible, of all effusion from the joint.

3rd. To avoid all pressure on the sides of the joint, since such pressure must inevitably force the synovial fluid to bulge forwards into the laceration, and thus separate the fragments.

4th. To secure the lower fragment as high, and the upper one as low, as possible.

If the effusion be but little, an attempt may at once be made to secure co-aptation; but if otherwise it is better, I think, to wait a while and to use ice to hasten absorption.

PROP. XXV.—Some unexpected results—hitherto, I believe, not described—frequently occur and in some of the best cases prevent the hopes of the surgeon from being fulfilled. Amongst these it may be mentioned that the quadriceps muscle undergoes a very remarkable wasting during the patient's confinement to bed. This wasting is altogether out of proportion to that of the other muscles of his limb and is almost invariably attended by corresponding loss of power.

The wasting of the extensor muscle is, I believe, an almost constant result. If you measure the two thighs, that of the injured side will be much less in girth than the other, and examination will show that the loss of substance is almost wholly in front, the flexors being still plump and large. The patient will be able very easily to put his flexors in action, whilst he will be almost unable to attempt extension, or will do so in a very feeble manner. In many cases he will be absolutely unable to do so, and attempts to lift the limb will result in his bending the knee a little, and then accomplishing a slight elevation chiefly by means of the sartorius.

It is clear that mere disuse will not account for these results; for the flexors must have been, equally with the extensor, at rest during treatment. The explanation must probably be sought in the same physiological law which disables the patient from calling the muscle into action in the early part of the case.

PROP. XXVI.—In probably more than half of the cases of

transverse fracture of the patella, the quadriceps remains ever afterwards thin and weak, whilst in a not inconsiderable number, it is completely atrophied.

Even in the best cases,—in which the patient regains good power over the extensor and can lift his leg, or kick vigorously,—it is still usual to find the muscle much less bulky than its fellow. In a large proportion the loss of bulk on the front of the thigh is perceptible both to the eye and the hand. I have met with at least six cases of absolute atrophy, so that the bone was quite bare. Most of these were old cases which had been variously treated, but one was in a patient of my own. I do not believe that details of treatment have anything to do with causing or preventing this curious result.

PROP. XXVII.—In almost all cases of fracture with separation, the structures connected with the upper fragment acquire a degree of rigidity during the treatment, which afterwards prevents the upper fragment from easily passing downwards in flexion of the knee.

The condition referred to is, I suppose, one of atrophic contraction. Hunter thought that when separation of the fragments resulted, the extensor muscle must remain too long for its work, and that the patient had to be educated to unusual exertion of it in order to make it act upon the patella and tibia, but, probably, the reverse is the case, and atrophic shortening is the real result.

PROP. XXVIII.—Thus the real danger as to stretching a ligamentous union, is in letting the patient *bend the knee*, there being little or no danger in allowing him to use his quadriceps.

The function of the extensor muscle has been greatly diminished, both as regards ability to contract and also to relax. It can do neither well. It can neither allow the patella to move downwards in flexion, nor draw it much upwards in extension. After a time it will improve in both

respects; but, meanwhile, if flexion have been permitted, the uniting ligament will certainly have been stretched.

PROP. XXIX.—Unless the surgeon has in any case deliberately abandoned all hope of benefit from keeping the ligamentous union short, he ought, on no account, to permit even passive flexion of the knee.

Several authorities, more especially Mr. South (see his edition of Chelius), recommend systematic flexion in the sitting posture at an early period, in order to prevent stiffening of the joint. If my conclusions are correct such exercises are certain to stretch the medium of union, and that often very rapidly. I learned the danger from observing this result.

PROP. XXX.—In any case of weak union the surgeon has his choice,—

1st. To let the patient have motion at the knee with the inevitable result of stretched ligament, or

2nd. To keep him permanently with a straight knee and wearing an apparatus.

It may be doubted whether there is any third possibility.

I apply these propositions to all cases in which the fragments are united by fibrous tissue, but not so firmly but that lateral movement can be produced between them. In all such, if flexion is permitted within six months, the uniting structures will stretch, and I do not know that the liability does not extend much longer.

PROP. XXXI.—In cases of close and firm fibrous union (so-called "bony unions") it will be wise to try flexion cautiously. If the patella moves downwards easily then probably it will be perfectly safe.

If the limb can be bent without giving pain, and the whole patella carried downwards as one bone, then the

result is equivalent to bony union, and probably no ill results will follow from use.

PROP. XXXII.—After complete atrophy of the quadriceps a person can walk very well, and may follow almost any occupation.

The main risk is that owing to the weakness of the limb another fall may occur, and the other patella be broken.

I have met with patients in this condition who could walk twenty or thirty miles a day, and one who was a van-driver and accustomed, with care, to clamber up and down to his box without material inconvenience.

PROP. XXXIII.—The main question for the surgeon in deciding as to whether to advise a patient with weak union to bend the knee or to keep it straight and supported permanently by an apparatus, is as to which plan is the most likely to prevent falls.

The convenience in walking will be found almost equal.

My impression is, that the use of external support adds materially to the patient's safety, and often to his comfort also. I have met with patients, however, who preferred a thin bandage or an elastic knee-cap to a stronger support.

PROP. XXXIV.—The frequency with which the quadriceps atrophies after transverse fractures, suggests the desirability of using galvanism from the first to maintain its nutrition. If used, the limb should, during the process, be raised to the utmost, and the patient made to sit up in bed.

Recapitulation.

Thus then, briefly to recapitulate, I have tried to show—

1st. That a very remarkable state of physiological

inactivity in the damaged muscle results from fracture of the patella.

2nd. That the fact of this inactivity destroys the common explanation of the displacement of the upper fragment.

3rd. That this displacement is usually due, not to muscular traction from without, but to fluid pressure from within.

4th. That the real cause of weak union is the bulging of fluid between the fragments.

5th. That atrophic shortening of the quadriceps often follows these injuries, and, whilst it greatly disqualifies the muscle for extension, renders flexion very dangerous to the uniting ligament.

6th. That an exceedingly interesting and curious occasional result is, permanent and complete atrophy of the muscle concerned.

Should the conclusions which I have stated be confirmed by future experience, it is probable that they will also be found applicable to some other forms of fracture and of injury to tendons. Indeed, it is in the possibility that they may illustrate a physiological law of wide bearing that their chief interest consists.

A CASE

OF

DISSECTING ANEURISM OF THE AORTA.

BY

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Received May 25th.—Read June 22nd, 1869.

Early in May, 1869, I was requested to assist at the post-mortem examination of a gentleman, Mr. N—, æt. 71, who had died from disease of the heart. Two other medical men were present at the autopsy: Dr. Beeby, of Bromley, who had attended the patient during his fatal illness, and Mr. Oliver Chalk, of London.

I was informed that Mr. N— had led a very active life, and had continued to take horse exercise up to four or five months before his death, although his medical attendants had recognised, some years before, that he had disease of the heart, a loud bruit having been discovered, audible over a large part of the chest. Since the commencement of the present year he had been suffering much from dyspnœa, and had been gradually failing in health; but he had had no dropsy, or only a very little œdema of the ankles. He sank very gradually, having been almost moribund during a whole fortnight.

These were nearly all the facts concerning Mr. N—'s illness that I learnt before the post-mortem examination. They pointed to the probability that the disease, if

valvular, would be found rather in the aortic valves than in the mitral.

The body was spare and thin, but not extremely emaciated; there was no dropsy.

The head was not examined, nor the spine.

On opening the thorax, it was at once seen that the anterior part of the arch of the aorta was much larger than natural; and, as this was the first seat of the disease, it will be well at once to proceed to the description of the appearances presented :—

When the canal of the aorta was laid open, a most remarkable condition was observed. At a distance of less than an inch above the aortic valves, the inner and middle coats[1] were divided in the whole circumference of the tube, so as to form an oval aperture with a smooth slightly everted margin, projecting into the cavity of what had been supposed to be the arch, but was now seen to be a large aneurismal sac, formed (mainly, at any rate) from the external coat of the aorta. The separation of the aortic coats extended on one side (in front and towards the right) down to the base of the heart, thus coming into close proximity to the base of the right ventricle. On the left side, and behind, no such separation existed; and here only the edge of the divided coats and the different appearance of the lining membrane served to mark off the inner surface of the aorta from that of the aneurism. About an inch and a half above the truncated extremity of the aorta, another large opening into the aneurism was seen, which led into the continuation of the arch. This aperture, also, was oval, and its slightly everted edge was perfectly smooth, except posteriorly, where a portion of it had been frayed off into an irregular tail, or process, of no great size. From this point two channels,—the one aneurismal, the other the aortic arch—ran on for nearly three

[1] This expression is probably not strictly correct, since Dr. Peacock has shown that the middle coat is in reality split by the dissecting process, and that part of its structure can be found in the outer wall of the sac. For convenience, however, I have adhered to the ordinary way of describing such cases.

inches side by side; but the sac of the aneurism preponderated so greatly in size that the arch seemed, as it were, to be imbedded in its anterior wall. Of the three main branches of the aortic arch, the left carotid and the left subclavian came off normally; the blood had not, to any extent, forced a passage between the coats of these arteries, only there were slight indentations in the wall of the aneurism, which marked the origins of the two branches, and indicated a slight tendency to the extension of the dissecting process along their tracks. The root of the innominate artery presented a different condition. Round the great part of its circumference the inner and middle coats of the aorta were completely torn away from it, so as to form an oval communication between the aneurismal sac, and the interior of the arch. The innominate artery, in fact, appeared to arise more directly from the former than from the latter. The aperture of communication was like those above described, smooth, even, and with an edge slightly everted.

A little below the origin of the left subclavian artery the outline of the aortic arch became more marked on the inner surface of the aneurism, and its canal almost immediately afterwards opened a second time into the sac. Here there was again a sharply-defined edge, indicating that the inner layers of the aortic coats had been torn through in their whole circumference; but the aperture was flattened and oblique, and was evidently smaller than that by which the blood entered the arch.

Beyond this the blood was, for a space, confined only by the aneurismal coats, but about an inch lower, the tube of the aorta recommenced by an oval smooth opening, just like those above described.

There was, thus, again a double channel, a sort of double aorta, and throughout the whole length of the main arterial canal this disposition was preserved. The anterior of the two channels was that of the original aorta; the posterior was that of the dissecting aneurism. This last quickly diminished in size below the aortic arch, and throughout

the mediastinum and along the lumbar vertebræ, its calibre was probably about equal to that of the aorta in front of it. On transverse section the form of the two channels were very different; that of the aorta was circular or oval, that of the aneurism semilunar. To employ a comparison made use of by Professor Henderson in reference to a similar preparation, their cut faces looked like those of the two ventricles of the heart when divided transversely; the form of the left ventricle answering to that of the aorta, the form of the right ventricle to that of the aneurism in this case.

Below the bifurcation of the aorta, the disposition differed somewhat on the two sides of the body. The left common iliac was at first double, but the septum was maintained only for about a quarter of an inch, below which the aneurismal channel opened into the artery by a smooth aperture. In the right common iliac artery the channel was double throughout its whole length; but immediately below its division into the external and internal iliac arteries, an oval ring was seen in the external iliac artery, leading from the one tube into the other; and this formed the termination of the aneurism. The external iliac artery thus derived its blood, partly from the aneurismal channel, partly from the common iliac trunk in front of it. The internal iliac was altogether single, and seemed to have received its blood entirely from the aneurismal channel.

The state of the lining membrane and coats of the aorta varied greatly in different parts of its course. Commencing with the aortic valves, these were much diseased. Two of them were blended together, the line of union being marked on the upper aspect of the single valve which resulted by a thick mass containing much calcareous deposit. The interval between the valves was thus converted into a slightly sinuous transverse slit. The sinuses of Valsalva were much dilated, forming quasi-aneurismal pouches. The lining membrane of the aorta was smooth, up to the point where it was first torn across, and the coats were almost free from atheromatous change. The lining membrane of the arch, again, was

almost perfectly smooth. The surface of the aneurismal sac, on the other hand, was markedly uneven, and contained a good deal of atheroma. There was no coagulum in the interior of the sac, with the exception of a mass about two inches in diameter, and of no great thickness, which lay in the angle between the base of the aorta and the aneurismal wall, where it was, of course, out of the line of the blood stream.

In the lower part of the chest, and in the abdomen, the appearances presented by the inner surfaces of the aorta and of the aneurism contrasted curiously with those observed above. Here the interior of the aorta itself was much roughened by plates of atheroma, and contained a good deal of coagulum, adherent to its surface in patches. The aneurismal channel, on the other hand, had a remarkably smooth and polished lining—as smooth and polished as the lining of any healthy artery could be—except where there was an occasional patch of atheroma. Nor was it merely a lining membrane which had thus been developed in the new canal; the subjacent tissue, the fibres of which ran transversely like those of the middle coat of the aorta, was also to some extent a new formation. This was apparent from the fact that the fibres were easily traceable across the angles which marked the lateral limits of the separation of the aortic coats. In horizontal sections the channel of the aneurism was indeed seen to be surrounded by a ring of some considerable thickness, which passed all round it, and must therefore have been developed subsequently to the formation of the aneurism. Under the microscope this tissue was seen to be made up of fibres identical in appearance with those of elastic tissue.

It did not appear that any of the branches of the abdominal aorta had prolongations from the aneurism, so far as could be determined after removal, when some of them were found to have been cut away. Nor did any of the arterial branches open into or communicate with the aneurism, with the exception of the small posterior branches, namely the intercostal and lumbar arteries. Some of these were found

to have been cut completely across by the stream of blood. A probe introduced into the aortic orifice of one of these little branches passed directly into the aneurismal canal, and traversed this before entering the artery itself, which thus appeared to arise immediately from the aneurism. [I have since found that a similar condition is described by several of the writers who have published cases of this kind.]

The heart was much enlarged. Both ventricles were greatly dilated, but their walls were of nearly normal thickness. The right auricle was very much larger than natural, having been perhaps stretched by the aneurism, which lay close to its inner wall; the tricuspid orifice was also much widened. The left auricle was much smaller than the right; the mitral valve healthy, but with some fibrous degeneration of the musculi papillares.

The lungs were sound, except that the left one was in part carnified, owing to the presence of a considerable quantity of fluid in the pleural cavity.

The liver presented a marked degree of the "nutmeg" condition; there was no trace of a cirrhotic change.

The right kidney was atrophied; its pelvis dilated, containing a small calculus and grains of uric acid. The left kidney had undergone compensatory hypertrophy.

There was hydrocele of the right tunica vaginalis, the contained fluid being of a yellowish-brown colour.

After the post-mortem examination inquiry was, of course, made whether Mr. N— had ever had any sudden seizure, to which the first formation of the aneurism could be referred. He had formerly been a patient of Dr. Maxwell Masters, of Isleworth, who kindly furnished Dr. Beeby with some information which seems to clear up this point. "On one occasion," says Dr. Masters, "Mr. N— came to my house during my absence and greatly alarmed my wife by complaining of intense pain in the heart, which made him so *faint*, and, as my wife says, *blue*, that she feared he would die. Some brandy or wine was given him, and he gradually got better, and was able to walk home

from my house, a distance of a mile or a mile and a half. Was this the beginning of the aneurism? It would seem so."

"Even before this attack," continues Dr. Masters, "Mr. N— used to complain of a painful sense of constriction in the region of the heart, as if a bar were placed across his chest, preventing its due expansion. He would now and then get attacks of indigestion, after which this painful sensation would manifest itself. I do not remember that he ever had any decided symptom of gout, but I used to consider him of gouty diathesis. Until the seizure above mentioned I did not attach any very great importance to the heart symptoms, as he was able in general to take violent horse exercise without inconvenience."

Dr. Masters does not state how many years ago the attack above referred to occurred; but Mrs. N— fixed its date at about six years before her husband's death. So far as is known he had not received any injury at the time, but he was a very active man, used to ride, hunt, and had frequently been thrown from his horse, so that it is quite possible that there may have been some exciting cause for the rupture of the aortic coats, at whatever time this took place.

After the severe seizure Mr. N— continued to suffer from pain in the heart for about a month. The seat of the pain is fixed by the fact that poultices were applied for its relief. At the end of the time named he regained his usual health, and never afterwards complained of pain in the situation of the heart. A loud bruit was heard by his medical attendants, and was attributed to valvular disease of the heart, supposed to be of long standing.

About a year ago Mr. N— was seized with severe dyspnœa during the night, and after that time he had several slight attacks of a similar kind. This appears to have been the commencement of the symptoms which ultimately proved fatal. Dr. Masters mentions that, about eighteen months or a year before his death, he met Mr. N— on an omnibus, and that the latter was then appa-

rently in rude health. He continued to take active horse exercise until within the last four or five months of his life. In the autumn of last year he was thrown from his horse without experiencing any particular ill effects. In January, 1869, he rode four or five miles on horseback.

From the commencement of the present year he gradually began to lose flesh, but his appetite remained good until quite the end of his life. His pulse was feeble, quick, and irregular. He had increased dyspnœa; he never spat any blood. He sometimes had pain over the epigastrium and liver, *never any in the chest.* There was never any dropsy beyond slight œdema of the ankles. A very loud bruit was audible over the greater part of the chest; it was not especially harsh or whizzing in character. It appears not to have been double, and to have been louder at the base than at the apex of the heart. There was increased dulness over the heart.

During the last fortnight of his life Mr. N— was gradually sinking. At night, and latterly during the day, his mind wandered; but he was not unconscious. He generally lay low in his bed, but was sometimes propped up with a chair.

Remarks.—The subject of dissecting aneurism is one which has for some years been made the occasion of careful study by Dr. Peacock, who has recently collected and analysed as many as eighty cases, capable of being placed under this denomination.[1] I nevertheless venture to think that the case above related is worthy of record, not only as an instance of a very rare form of the disease, but as presenting some features which are in the highest degree exceptional or even unique.

Dr. Peacock has divided his cases of fully formed dissecting aneurism into two groups, the one (which includes

[1] 'Transactions of the Pathological Society of London,' 1863, vol. xiv, p. 87. Some of these cases—and notably many of those taken from Rokitansky's work—would, I think, be more fairly called examples of rupture of the aorta into the pericardium, than of true dissecting aneurism.

seventy-three cases) answering to the "early stage" of the affection,—the other (of which only seven or eight cases are on record) belonging to the "advanced stage," in which there is a distinct sac, within the arterial tunics, but having a lining membrane of its own, very similar to the natural lining membrane of the arteries. Now, to this second group my case must be added.

Moreover, in some, even of the seven or eight cases referred to by Dr. Peacock as belonging to the advanced stage of dissecting aneurism, the sac was of comparatively small extent. This remark applies, for instance, to the two cases recorded by Shekelton,[1] and to that of M. Cadet Gassicourt.[2]

There are thus left not more than four, or at most five, cases in which (as in that of Mr. N— above related) a dissecting aneurism is known to have extended along a great part, or even the whole length, of the aorta, and in which life has, nevertheless, been maintained for a sufficient length of time to enable the sac to become provided with a distinct lining membrane.

One of these is a case recorded by Dr. Pennock.[3] The affection began half an inch above the semilunar valves, and extended from the origin of the aorta to its bifurcation, and also along the innominate and left carotid arteries. It had probably commenced eight years before death, when the patient, a woman aged 75, had been seized with sudden and severe pain at the sternum, while pumping water.

A second case is that of Dr. Henderson.[4] In it the sac commenced immediately beyond the origin of the left subclavian artery, and terminated by opening into the left common iliac artery, an inch beyond the bifurcation of the aorta. The history of this patient was very scanty; all that could be learnt was that she was sixty years of age, and had been

[1] 'Dublin Hospital Reports,' 1822, vol. iii, p. 231.
[2] 'Bull. de la Soc. Anat.,' 1856, 31re année, p. 85.
[3] 'Am. Jour. of the Med. Sciences,' vol. xlv, 1838, p. 13.
[4] 'London and Edinburgh Monthly Journal,' vol. iii, 1843, p. 613.

affected for two or three months with a disorder of the breathing, and with dropsy, which had gradually increased.

Next may be taken a case which was described by Bouillaud,[1] as one of congenitally double aorta, but which I quite agree with Dr. Peacock in believing to have really been one of dissecting aneurism. The aorta had a double channel from just above the aortic valves; and of the two canals one terminated in the right, the other in the left common iliac artery. Just above the origin of these arteries an oval aperture (compared by M. Bouillaud to a foramen of Botal) led from one channel to the other. On the view that the case was one of dissecting aneurism, this aperture can evidently be explained, by supposing that the mouth of one common iliac artery had been torn away from the lining membrane of the aorta, exactly as had happened to the innominate artery in the case which forms the subject of this paper. The duration of the disease in Bouillaud's case was not exactly known; but the patient said he had been ill a year, and that after an effort he had experienced a severe pain in the lower and anterior part of the chest, with paroxysmal cough, oppression, &c.

A fourth case is that recorded by M. Goupil.[2] The sac commenced at the level of the origin of the aorta, and terminated in an oval aperture, which entered the aorta just where it crossed the left bronchus. For a considerable distance the tube formed by the inner and middle coats of the arch appears to have been in its whole circumference free from attachment to the interior of the aneurism. It was, however, adherent at the origins of the three main branches. The aneurism sent a funnel-shaped prolongation along the front of the innominate artery; and along the left carotid artery it had dissected a channel, which terminated by opening into the internal carotid. The only indication in the patient's history, pointing to the date of origin of the aneurism, was that about eleven years before he had one day, while in the street, been attacked with giddiness, and

[1] 'Archives Générales de Médecine,' 1847, vol. xv, p. 248.

[2] 'Bull. de la Soc. Anat.,' 1853, p. 276.

fallen insensible to the ground. He had subsequently suffered from all the symptoms of cardiac disease, of which he died at the age of fifty-two.

The fifth case is that which is related by Dr. Latham in the 'Pathological Transactions,'[1] and which differs from all other recorded cases in having been diagnosticated during life by Dr. Swaine. A man aged fifty-one was walking, when he was seized with sudden and agonising pain in the chest, darting down the left of the spine, and with loss of power in the lower limbs, in which, moreover, no pulse could be felt. He lived three months. The middle and internal coats of the aorta were found to be torn through a few lines below the origin of the left subclavian artery, and the blood had forced its way between the arterial coats as far the bifurcation of the abdominal aorta.

There is, in many respects, a great general similarity between these five cases and that which forms the subject of this communication; but there are also some points of difference.

With regard to the duration of the disease, it would appear that this was, in two instances, longer than that which is believed to have been the duration in my case; being (as was supposed) eight years in Dr. Pennock's case, and perhaps eleven years in M. Goupil's, while in mine it was probably six years. But all these dates seem to be very uncertain.

If, however, other patients have lived longer than Mr. N—, with a fully developed dissecting aneurism of the aorta, it does not seem that any one has been so free, as he for a long time was, from all severe symptoms. Till within a few months of his death he appeared to all but medical eyes a remarkably healthy man. He rode on horseback, hunted, and was even thrown from his horse without any apparent ill effect.

Another remarkable feature in Mr. N—'s case is the slight duration of the only attack of faintness and pallor which he seems ever to have had, and which we therefore

[1] Vol. vii, 1855-56, p. 106.

cannot but suppose to have coincided with the commencement of the aneurism. He complained of intense pain in the heart, and was very faint and blue; but he rallied from these symptoms, and was soon able to walk home, a distance of a mile or a mile and a half.

Now it appears to me that these peculiarities in Mr. N—'s case depended on the circumstance that the dissecting aneurism communicated by more than one opening with the interior of the aorta. As has been described, there was one laceration about an inch and a half above the semilunar valves; and just below the origin of the left subclavian artery, the aorta was again torn across. No branch of any size, however, leaves the aorta at this spot; and the existence of an aperture in such a situation can be explained only on the supposition that it was formed at the commencement of the disease. Both lacerations were probably at first quite small, and the blood which made its way out of the aorta through the one, found a tolerably direct passage back into its channel through the other. All the further steps in the development of the aneurism may fairly be supposed to have taken place gradually, and almost imperceptibly.

It is decidedly in favour of this hypothesis that there is only one recorded case of dissecting aneurism in which life was prolonged for any considerable length of time, and in which it can be said with certainty that no such second communication with the natural arterial channel existed. In Shekelton's two cases there were free openings into one or both iliacs, the sac commencing only a little above the bifurcation of the aorta. In Pennock's case not only were there openings in the prolongations which accompanied the three main branches of the aorta, but the aorta was perforated by numerous foramina, by which communication was established between it and the external vessel. In Henderson's case there was an elliptical aperture in the left common iliac artery, communicating with the aneurismal channel. In Bouillaud's case, as has already been mentioned, there was an oval foramen leading from the

aneurism to the aorta, just above the bifurcation of the latter. In M. Goupil's case the aneurism terminated in the aorta, just where the latter crossed the left bronchus. The one exception is in the case recorded by Dr. Swaine. In that case the patient lived three months after the first symptoms had appeared, but he was all the time in a most precarious condition.

On the other hand, in those cases which have rapidly gone on to a fatal termination there has almost invariably been but a single opening from the aorta leading into the arterial coats. To this rule I have found but two exceptions—one was in a case of Dr. Dickinson's,[1] in which, besides a transverse laceration an inch above the aortic valves, there was another irregular rent higher up, and the origins of the three main branches of the arch were likewise marked by transverse slits. The patient had died from rupture into the pericardium within twenty-four hours of his first seizure. The other exception is presented by one of Rokitansky's cases.[2] There was a transverse fissure in the aorta about an inch above the valves, and on the opposite side of the arch a second laceration, by which the sac of the aneurism opened into the descending aorta. The patient, a man, æt. 63, had fallen down insensible, pale, cold, and sweating. After five minutes the pulse became again perceptible, consciousness was restored, and at midday he took some broth. In the afternoon a second attack took place, and he died in a few minutes. Rupture had taken place into the pericardium. It is impossible not to be struck with the similarity between this case and that which forms the subject of this communication, in the comparatively short duration of the original attack in each instance. Although I have mentioned this case of Rokitansky's as an exception, it goes a long way to prove the correctness of the rule.

It would appear, then, that when the patient rallies

[1] 'Transactions of the Pathological Society of London,' vol. xiii, p. 48.

[2] 'Ueber eine der wichtigsten Krankheiten der Arterien,' Wien, 1852, p. 61.

quickly from the first shock which accompanies the formation of a dissecting aneurism, and particularly when he returns to a state of tolerable health and survives for a considerable length of time, we may expect to find a free communication between the aneurismal sac and the aorta or some large artery, by which the blood has been able to return from the former into the latter.

Another remarkable feature in which my case differs from all those previously recorded is the form, or rather the extent, of the aperture leading from the aorta into the aneurism; this aperture is generally of no great size, even in the more protracted cases of dissecting aneurism. In Pennock's case it was a valvular fissure half an inch in length, with rounded edges. In Henderson's case there were two openings: the one a slit, an inch and a tenth long, extending in the direction of the axis of the vessel; the other, a quarter of an inch long, commencing near the termination of the former and running in the same direction. In Bouillaud's case the parts are described as having been like a double aorta, divided by a septum which began just above the aortic valves, as a sort of diaphragm or hymen, pierced by an annular opening. Only in the cases of Swaine and Goupil did the rupture extend round the greater part of the circumference of the aorta.[1] In the former "the inferior portion of the artery was attached to the upper portion only by about one sixth of a circle at its posterior part." In the latter the separation was yet more nearly complete, the aorta being cut into two parts, which had an interval of five centimètres between them, and were connected together only by a narrow process of the inner and middle coats, half a centimètre broad and four and a half centimètres long.

In my case even this narrow connecting band between the two portions of the aorta was wanting. The internal and part of the middle coats of the ascending part of the

[1] I do not here include some of Rokitansky's cases, in which the lacerations were, no doubt, very extensive, but in which death was immediate, or delayed only for a short time.

arch were cut across in the whole circumference of the tube, and almost as cleanly as if they had been divided by a knife. Nor was this laceration the only one; in the descending portion of the arch the coats were again divided throughout their whole circumference. In each situation a wide gap existed, bridged over only by the wall of the aneurismal sac.

It is, perhaps, worthy of mention that M. Leudet, in a report on M. Goupil's case above referred to, raised the question whether the aorta could be torn thus completely across and life be maintained. And he was inclined to dispute the possibility of such an occurrence on the ground that the elasticity of the arterial coats would necessarily lead to the retraction of the upper segment and to the closure of its canal, thus interfering with the supply of blood to the large branches of the arch, unless, indeed, these should themselves have apertures of communication with the sac of the aneurism. This speculation of M. Leudet's is confirmed to a certain extent by my case, for as a matter of fact the innominate artery derived its blood mainly from the aneurismal sac; the calibre of the arch was greatly narrowed, and it probably did very little beyond supplying the left carotid and subclavian arteries. It appears likely that almost all the blood distributed to the lower part of the body entered the descending aorta directly from the aneurismal sac, without having passed through the arch.

There remains only one point on which it seems necessary that a few remarks should be made, and that is with reference to the lining membrane and coats of the new channel which traversed the whole length of the thoracic and abdominal aorta in the substance of its wall. I have already observed that not only was this channel lined by a smooth and shining membrane, but that it was surrounded by layers of yellow elastic tissue, which were traceable round its whole circumference, and which, therefore, must necessarily have been new formations. When I first noticed this fact it seemed to me one of very great interest, as having an important bearing on the question of the

formation of aneurisms generally; and this was the main reason which led me to think of bringing my case under the notice of the Society. I have since found, however, that I have in this matter been completely anticipated by Dr. Henderson, and I cannot do better than quote the words of this writer, whose very able paper on the subject of dissecting aneurism has, perhaps, hardly received the recognition it appears to deserve. "From the study," says Dr. Henderson,[1] "of such cases as those of Dr. Shekelton, and the one noticed at length in this paper, in which time had been afforded for ulterior changes to occur, a point of very considerable pathological interest may be ascertained. I allude to the question of the formation of a new membrane as a lining to the interior of aneurisms, which have originated, as is commonly the case, from ulceration or rupture of certain of the coats. It is true that the anatomical structure of aneurisms of the ordinary kind has appeared to some authors fully to warrant the conclusion that a new lining membrane not unlike the proper inner coat of an artery, especially of a diseased one, and very apt to be confounded with it, is capable of being formed in aneurismal sacs; but the almost unlimited amount of dilatability which some authors ascribe to the inner coat of arteries appears to leave the question still in need of such facts as withdraw the attempted demonstration of such a lining membrane having been actually formed, from the reach of any possible application of the expansibility of the inner coat of the artery, to the explanation of the apparent occurrence of such a new membrane. In a case of aneurism of the aorta as large as a man's head Naegelé avers that he could trace the inner coat of the vessel over the whole interior of the sac, and in opposing this statement, simply on the ground of the greater likelihood of the membrane having been a new formation, than a dilatation of the old inner coat of the vessel, there would be merely a conflict of opinions; but in the event of a membrane being found in the interior of such a dissecting aneurism as the one I have

[1] 'London and Edinburgh Monthly Journal,' vol. iii, 1843, p. 620.

described, different from the middle and outer coats proper to the artery in its healthy state, there can be no room whatever for questioning the conclusion that such a lining membrane is new. The description given of the lining membrane of the new channel, in the case I have adduced in this paper, clearly proves that it was a new formation, and the facts which have been stated respecting it were ascertained with so much facility, as to leave no room to doubt their accuracy. I have only to add, in regard to that membrane, that when a slip of it was examined by means of a pretty high magnifying power, it exhibited a fibrous structure bearing a close resemblance to that of the *ligamentum nuchæ*, as figured in Gerber's 'General Anatomy,' and easily distinguishable from that of the middle coat of the artery. The fibres had a somewhat oblique transverse direction."

DESCRIPTION OF PLATE III.

FIG. 1 represents the posterior aspect of the heart, and the interior of the aneurism, as this appeared when laid open by an incision carried along its hinder surface, somewhat obliquely downwards.

a Is the ascending aorta, completely divided at *b*.

c Indicates the continuation of the arch, which is again interrupted at *d*.

e Is the opening which leads from the aneurism into the descending aorta.

f Shows the origin of the arteria innominata from the sac, with a corresponding aperture in the aortic arch.

g and *h* Are slight depressions in the sac at the origins of the left carotid and left subclavian arteries respectively.

FIG. 2 shows a transverse section of the two common iliac arteries immediately below their origin from the abdominal aorta. Each artery is seen to have a double channel, and each channel to be surrounded by coats of its own. The position of the arteries appears reversed, that to the right (*i*) being the left common iliac, and that to the left (*k*) the right common iliac. In the left artery the two channels communicate almost immediately below the face of the section by an aperture through which a probe is seen to pass.

FIG. 3 shows the termination of the right common iliac (*l*) and the commencement of the right external iliac (*m*) arteries. These arteries have been laid open on the upper (anterior) surface. Above the cut edge of the common iliac artery the aneurismal channel behind it is indicated at *n*. At *o* is seen an aperture of communication, between the channel of the aneurism and that of the artery, and this constituted the end of the aneurism.

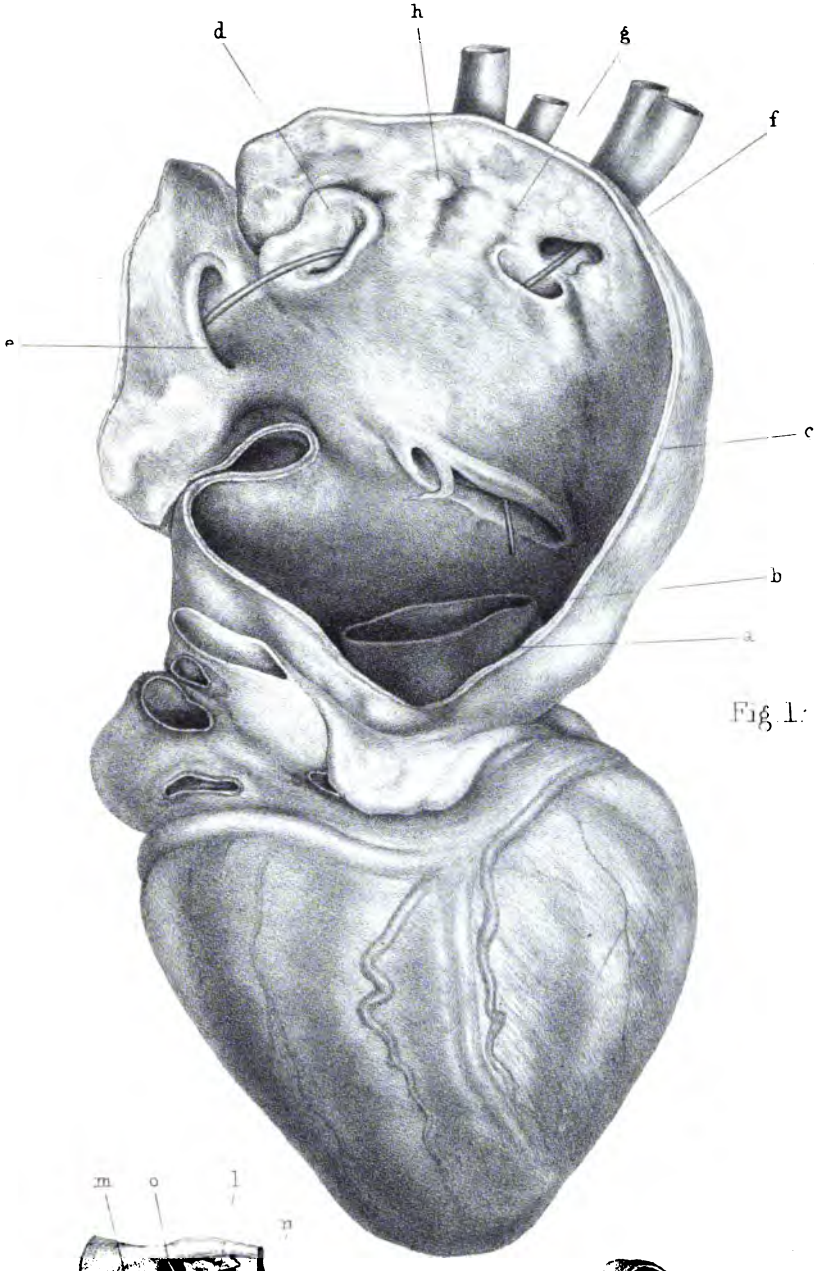

Fig. 1.

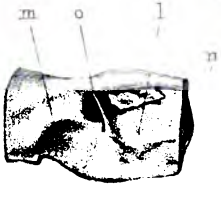

Fig. 3.

Fig. 2.

G.H.Ford chr sc.

W.West imp

ON THE

ENLARGEMENT OF THE VISCERA WHICH OCCURS IN RICKETS.

BY

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Received June 3rd.—Read June 22nd, 1869.

IT has long been known that with rickety children certain of the abdominal organs are apt to increase in bulk. Dr. Whistler, who gave in his dissertation 'De Morbo Puerili Anglorum,' published in 1645, the first account which we have of *the rickets*, as the complaint was even then popularly termed, described an enlargement of the liver and spleen as pertaining to the disease, and considered the "obstruction" in these viscera as the first departure from health. He introduced the more than sesquipedalian word Pædosplanchnosteocace,[1] as indicating that this disorder of childhood affected both the viscera and the bones.

Glisson, in his elaborate treatise upon rachitis, published five years later, refers to enlargement of the liver and mesenteric glands as belonging to the complaint, but considers that the spleen is not affected except as an accidental complication.

[1] Some interesting information concerning the bibliography of rickets is given by Dr. Gee in the 'Bartholomew's Hospital Reports,' vol. iv, p. 79.

Dr. Bright,[1] in the year 1838, described an enlargement of the spleen as occurring especially in early childhood, though he did not associate it with the rickety condition. He described this organ as becoming hard like a half-ripe apple, as having on section the lustre of damson cheese, as presenting numerous opaque whitish granules (apparently the enlarged Malpighian corpuscles), and as being swollen to such an extent as often to occupy the greater part of the abdominal cavity.

It appears, however, that little attention had of late years been directed to the state of the abdominal organs in rickets until Sir William Jenner, in his well-known lectures,[2] dwelt upon their changes in bulk and texture, and attributed them to an albuminoid infiltration. He pointed out that in the rickety enlargement the organs differ from the lardaceous or amyloid state in the absence of reaction with iodine, and, as regards the spleen in particular, in the absence of the sago-like transformation of the Malpighian corpuscles. He, however, made only a partial separation between the two conditions.

It seems that the alteration which the viscera undergo in rickets is still imperfectly understood, and is generally confused with the more common lardaceous or amyloid change, to which it bears a superficial resemblance while severed from it by essential differences.

I will now proceed to describe the changes which occur in the liver, spleen, and lymphatic glands in rickety children.

During the progress of rickets, if the disease be severe, and particularly if it be attended with emaciation, the liver is often found to extend below its normal situation, occasionally as low as the umbilicus, the smooth surface of the organ being very evident to the touch beneath the thin abdominal walls. The spleen under the same circumstances becomes enlarged, more frequently and to a greater extent, often acquiring seven or eight times its normal bulk and

[1] 'Guy's Hospital Reports,' vol. iii, p. 401.
[2] 'Medical Times,' 1860.

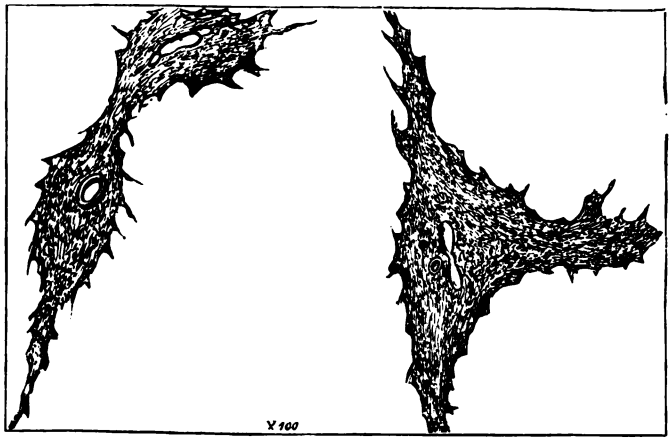
occupying the greater part of the left side of the belly. This organ, dragged down by its increased weight, often lies with more of its bulk below than above the navel, the upper edge of the spleen being below and nearly parallel to the lower edge of the liver. A swelling often takes place at the same time in the absorbent glands, particularly in those of the mesentery. The glands which lie near the surface of the body are often evident to the touch like shots under the skin, but the swelling is seldom such as to cause visible protuberance.

Before dealing with these changes in their clinical results their morbid anatomy may be taken into consideration.

The liver, to commence with this organ, undergoes an increase of size evenly throughout its whole bulk. It becomes less friable than in health, hard, dense and elastic. It is usually pale in colour, containing little blood. The acini, themselves of yellowish colour, are often each surrounded by a thin pinkish or grey line, so that the cut surface is covered with a fine uniform polygonal pattern, such as may be produced when from any cause there is an increase in the fibrous tissue. Sometimes in these cases it is evident to the naked eye that there is an increased quantity of loose material surrounding the smaller branches of the portal vein. The alterations which have been described are, in fact, produced by a general increase in the fibroid tissue which belongs to the organ. Within the smaller portal canals this change is very evident to microscopic examination, the fibroid sheath being, perhaps, of twice its normal thickness. The alteration described is well shown in the accompanying plate. Plate IV, fig. 1, shows the general appearance of a section of liver affected as described, showing the great increase of the portal fibrous tissue. The section of a healthy liver prepared in the same manner, and belonging to the same period of life, is annexed. The woodcuts from the same preparations (page 362) show under a higher power the proportion which in disease and in health the fibroid tissue bears to the vessels it surrounds. Accompanying the portal vessels, and extending beyond them, the fibroid tissue

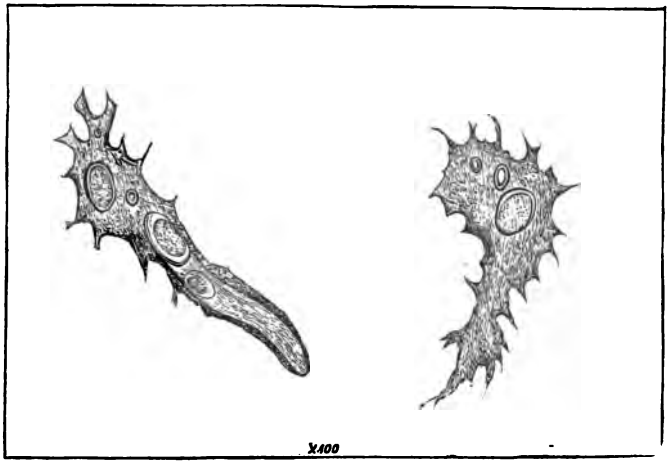
stretches between the lobules, circumscribes them more or less completely, and causes the demarcation which is so often evident to the naked eye.

FIG. 1.



Portal canals in rickety liver, showing increase of fibroid tissue.

FIG. 2.



Portal canals in healthy liver, showing relation of fibroid tissue to vessels.

In some cases it appears that the cell-holding network of the acini is more closely packed than in health, as if from an excess of epithelial growth. The epithelium is sometimes fatty, sometimes almost free from oil. In this respect there is no constant change.

With the spleen the increase of bulk is usually greater than with the liver. A spleen which ought not to weigh an ounce may come to weigh half a pound. The texture and colour are changed. The soft friability of the organ is replaced by a resilient hardness, in extreme cases resembling, to use the simile of Bright, the consistence of a half-ripe apple. The colour is generally a deep red or purple, besprinkled with smooth white spots, which are enlarged Malpighian corpuscles. When the enlargement is great the section is sometimes mottled with a pale buff material, finely intermixed with the deeper colour. In some cases the colour and texture are thus altered, although the increase of bulk is trifling or absent. The amount of blood in the vessels is generally less than in health.

The microscope shows that the minute structure of the spleen is modified in the following respects.

There is an increase in the delicate reticulum in which the splenic pulp is immediately contained. This network in the healthy spleen is of extreme tenuity, the threads slender, the interspaces comparatively large. In the rickety spleen the trabeculæ are often irregularly swollen, sometimes to such an extent that where the threads are thickest they may be as wide as the spaces they enclose.

The accompanying drawings show the change which has been described. (Plate IV, fig. 3.)

The larger fibrous divisions of the spleen are often widely separated by the swelling of the tissue between them, but in other particulars they are usually unaltered. In the case of a rickety dwarf, who died at the age of twenty-six, they were found to have become thickened.

In a case where the spleen was characteristically altered in consistence, but not increased in bulk, it was found that while the reticular basis of the organ was abnormally de-

veloped, the cellular and corpuscular contents of the network had become atrophied, being replaced by shapeless masses of blood-coloured or rusty matter.

When (as in the case of Wood, below) great enlargement has occurred, there is, in addition to the change in the trabecular tissue, an abnormal development of the contents of the meshes, the corpuscles being crowded together in a manner distinctly different from what occurs in health.

The absorbent glands, particularly those of the mesentery, are often enlarged and hard. On section they are white and opaque, in consequence of an accumulation of their cellular and corpuscular contents.

The kidneys are often increased in size, smooth and pale, the convoluted tubes being more than naturally distended by epithelium. I have not been able to discover any other change in their structure.

None of the organs affected as described give any reaction with iodine.

The change which occurs in the rickety viscera are due, not to any foreign growth or deposit in their tissue, but to an irregular hypertrophy of their fibroid or epithelial elements conjoined, as there is reason to believe, with a deficiency of their earthy salts. It thus appears that the alteration in the viscera is closely analogous to that which occurs in the bones.

The following cases illustrate the preceding statements.

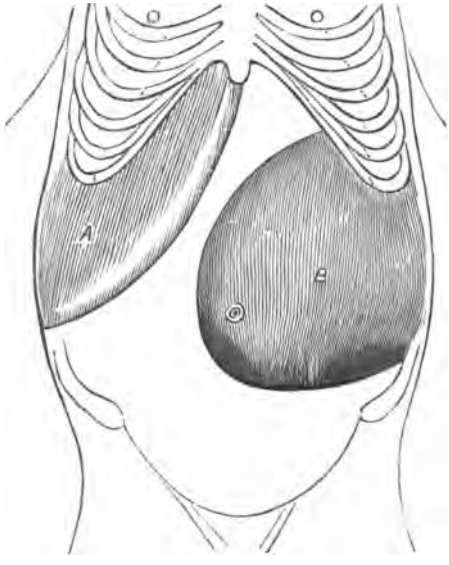
Case 1.—William Wood, 7 months old, was brought to me at the Children's Hospital, suffering from rickets and abdominal enlargement. He was a twin. He had been fed entirely upon artificial food—milk and biscuit. The parents had had three other children, all of whom had died, as I was told, with abdominal enlargement and symptoms similar to those observed in the present case. The child to whom the present statement refers failed in health from the age of four months, when he began to lose flesh, to vomit frequently, and to increase in bulk about the belly, the latter symptom having been very conspicuous for the

last six weeks. He had had otorrhœa from birth. There had been no symptoms to lead to any inference of syphilis.

The child had nodulated ribs, and the external signs of rickets to an extreme degree. The chief complaint was of diarrhœa and vomiting. He was emaciated and anæmic, and had the waxy complexion of splenic disease.

The belly was greatly enlarged, owing apparently to great increase in the size of the liver and spleen. The liver extended from its normal position downwards to the level of the umbilicus, its lower edge passing in a slanting direction from the ensiform cartilage to the right iliac fossa. The spleen had fallen below its usual situation, and occupied the greater part of the left side of the abdomen between the thorax and the pelvis, while a small portion of the organ could be felt on the right of the median line. These organs were traced in outline upon the skin, presenting the configuration shown in the annexed diagram.

FIG. 3.



A. Liver. *B*. Spleen.

In spite of nourishing food, cod-liver oil, and the iodides of iron and potassium, the child gradually sank, without any material change in the symptoms, and died five days after it was brought to the hospital.

At the post-mortem examination the swelling of the belly proved to be due, as anticipated, to enlargement of the liver and spleen, which occupied the position assigned to them during life.

The liver, which, under the circumstances in which the examination was made, could not be weighed, was much increased in size. It was smooth externally, firm in texture, and of a pale fawn colour. The acini were preternaturally distinct, each being surrounded by a pale pinkish-grey line, so that the section was covered with a honeycomb pattern of adjacent hexagons. Subsequent examination showed that this appearance was produced by an increase of the fibroid tissue which normally surrounds the portal vessels and makes its appearance at intervals between the lobules. Though the colour of the liver was suggestive of fatty change, the epithelium, which was finely granular and opaque, was unusually free from oil-globules.

The spleen weighed seven and three-quarter ounces, probably at least seven times its normal weight. It was firm and consistent, having much the feel of the lardaceous spleen, which, however, it did not in other respects resemble. On section it appeared to consist of a fine intermixture of a red and a pale buff material, the lighter disposed in small specks imbedded in the red. Under the microscope it was found that the larger fibrous divisions of the spleen were much further apart than in health, owing to a great increase of the splenic structure between them.

The increase of this tissue was in great part owing to a swelling of the delicate translucent network in which the cells and corpuscles are immediately contained. The swollen trabeculæ lay in large and irregular breadth, covering a considerable proportion of the section, instead of existing, as in health, in the form of slender threads, which, from

their tenuity, lie almost concealed by the cellular and corpuscular elements they enclose. The accompanying drawing shows the change described (see Plate IV, fig. 3).

Besides the increase of the trabecular tissue there was an absolute increase in the cells and corpuscles of the pulp. These were closely packed in the cavities of the swollen matrix, and were often in such close apposition that by mutual pressure many of the larger cells had been rendered polygonal.

The kidneys were perfectly natural.

The lumbar glands and all the absorbent glands within the abdominal cavity were swollen, and congested to a purple colour.

The pericardium was occupied by firm thin adhesions. The lungs were congested, particularly at their bases.

The organs which have been mentioned, as well as the stomach and bowels, were tested with iodine without the display of any "amyloid" reaction.

There was no tubercle in the body.

Case 2.—Ellen Smith died under my care at the Children's Hospital at the age of four years. Since she was a year old she had had swelling of several of the joints and of the hands. When in the hospital she was evidently rickety, the cachexia being strongly developed, while the change in the shape of the skeleton was comparatively slight. The child was emaciated and anæmic, the complexion earthy, the teeth decayed.

She was pigeon-breasted, and the ribs were swollen at their cartilaginous ends, though not so much as is sometimes seen. The wrists, knees, and ankles were swollen, though the shafts of the bones remained straight. A remarkable point in the case was the manner in which the symptoms simulated those of osteo-arthritis.

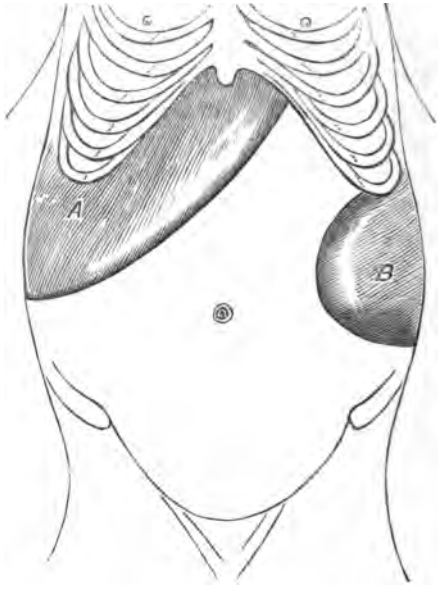
There was a peculiar swelling of the fingers, apparently due to enlargement in the substance, or in the immediate neighbourhood of the first phalangeal joints.

Almost all the limbs and joints were at times the seat of

severe aching pain, which varied with every change of weather, and were aggravated by the least movement.

The abdomen was prominent; the spleen was enlarged, being evident to the touch for a distance of two and a quarter inches below the ribs. The liver was also enlarged, reaching below the ribs for an inch and a half.

FIG. 4.



A. Liver. *B*. Spleen.

Her life was brought to a close by a febrile attack, which began with slight inflammation of the tonsils, was attended with severe diarrhœa, and showed, at last, the symptoms of pneumonia.

At the post-mortem examination the bones proved to be extremely rickety; their articular ends were large and soft, and their cancellous tissue contained a deposit of red glutinous matter. The insides of the joints were natural.

The swelling of the fingers was due to an increase of the

cancellous tissue of the first and second phalanges, like that which was found in the ends of the larger bones.

The pleuræ and pericardium were occupied by old adhesions. These were small recent vegetations upon both mitral and tricuspid valves. The lungs were congested and in patches gave evidence of lobular pneumonia.

The liver was attached to the diaphragm, the spleen to the diaphragm and abdominal wall, by old adhesions.

The liver weighed eighteen and a half ounces. It was resistent and tough; generally of a pale fawn colour. The acini were indistinct in outline. The section was traversed by vessels which to the naked eye had an exaggerated appearance, which the microscope showed to be portal veins surrounded by an excess of fibroid tissue. The epithelium, which was very closely packed, was slightly fatty.

The mesenteric glands were much enlarged. In section they were hard, close, and firm, the larger being opaque like the cortex of a kidney affected by scarlatinal inflammation; their appearance being suggestive of epithelial accumulation. On section it appeared that the increase of bulk was due to a great increase in the cells and nuclei belonging to the gland, more particularly of the former, which pervaded the whole tissue with an abnormal uniformity. No change was found in the fibrous stroma.

The kidneys were pale and smooth. The pair weighed four ounces. Small ulcers were found in Peyer's patches at the lower end of the ilium.

None of the organs gave any iodine reaction.

The spleen weighed eight and a half ounces, and measured five and a half inches by three and a half. It was rigid and hard, crushing under the fingers with a grinding sound. The colour was deep red, which was closely besprinkled with white Malpighian corpuscles. The section under the microscope was unusually dense, chiefly owing to a great increase and close arrangement of the cells and corpuscles.'

The reticulum of the spleen was somewhat exaggerated, but had undergone no marked alteration.

A portion of the spleen was incinerated for the purpose of ascertaining the proportionate amount of its earthy and alkaline components. It was found that, as in rickety bones, there was a deficiency of the earthy part. The results obtained are placed in apposition, for the sake of comparison, with a similar analysis of the ash of a healthy child's spleen; and one also of a lardaceous spleen obtained from a child who had died of phthisis with large vomicæ. The diminution of the earthy salts in the rickety spleen is sufficiently evident.

Mineral constituents of 100 *parts of fresh spleen.*[1]

	Earthy salts.	Alkaline salts.	Composition of alkaline salts.				
			Potash.	Soda.	Phospho-ric acid.	Sulphu-ric acid.	Chlorine.
Rickety spleen (Ellen Smith).....	·094	·989	·283	·196	·055	·025	—
Healthy spleen	·274	1·054	·322	·115	·118	·215	·096
Lardaceous spleen	·258	·658	·218	·115	·07	·049	·105

Passing to the clinical part of the question, while it is not necessary that I should repeat much which is well

[1] I may state that in three healthy spleens the alkaline salts in 100 parts were found to vary from 1·054 to 1·092, the earthy salts from ·121 to ·274. From this it would seem that while in the healthy and the rickety organ the amount of alkaline salts is nearly the same, the earthy salts exist in health in a decidedly larger proportion than was found in the rickety spleen which was examined. I regret that I am not able to give further observations as to the mineral constituents of the viscera in rickets; future opportunities may supply the deficiency. Cases of considerable splenic enlargement from rickets occur so seldom in post-mortem examination that a considerable time may pass before another analysis can be made. The difference between the rickety and the lardaceous spleen is very striking, one being deficient in the earthy, the other in the alkaline, constituents.

known as regards the history and results of rickets, there are several points to which I must draw attention.

The condition of the viscera which has been described is, as far as my observation has gone, peculiar to childhood, belonging especially to the first four years. It usually occurs in connection with the well-known signs of rickets as they affect the bones. I have never seen it well-marked except in such conjunction, though sometimes the visceral appear to precede the osseous changes; and it not seldom happens that the visceral change may be extreme when the modification of the skeleton is but slight.

The rickety state of the viscera, like the alteration in the texture of the bones, is transient in its nature. Under favorable circumstances the affected organs have a strong tendency to recovery, and even when swollen to the utmost will occasionally return to their natural dimensions.

The change in the abdominal viscera appears to interfere comparatively little with their functions. The swelling of the spleen, indeed, when considerable, often is accompanied by a tint of skin suggestive of leucocythæmia; but the excess of white corpuscles in the blood, as shown by microscopic examination, is comparatively slight.

The change in the liver is unaccompanied either by ascites or jaundice, and though the kidneys may be considerably enlarged, the urine remains free from albumen.

When the visceral change has taken place to a considerable extent the child is generally emaciated and anæmic, having either the earthy complexion of rickets or somewhat of the waxy look of splenic disease.

Such a child is especially liable to be attacked by the diarrhœa, bronchitis, or pneumonia, to which rickety children are prone, and these affections constitute the chief danger to which it is exposed.

The following case illustrates the symptoms and the favorable issue of the disorder which has been described.

Case 3.—Frederick Grant, fifteen months old, came under my care at the Children's Hospital, in June, 1868.

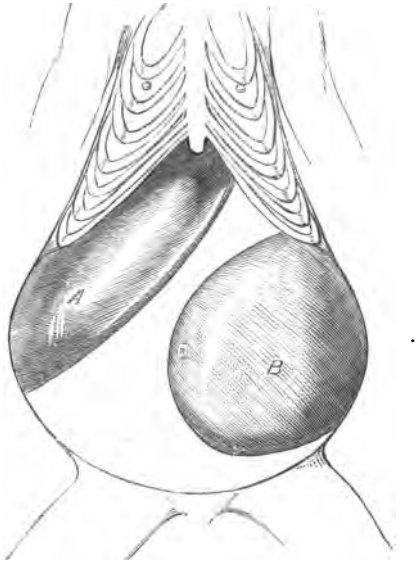
He was the second child of apparently healthy parents, the first being in good health. He had formerly been able to walk, but had failed in health after an attack of whooping-cough. He now could neither walk, nor sit upright, nor even hold up his head, but lay helpless, as his mother expressed it, "all of a heap" in her arms. His joints were enlarged, the anterior ends of the ribs presenting globular swellings. The chest was laterally compressed and the anterior fontanelle was widely open. He had the peculiar waxy pallor suggestive of splenic disease. The belly was prominent, and both the spleen and the liver were much enlarged, their outlines being easily traced through the thin integuments. The spleen had fallen below its normal situation, and lay in great part below the umbilicus, barely touching the lateral edge of the thorax above, while it stretched downwards to the outer end of the groin, and crossed the median line, so that the extremity of the organ lay a little to the right of the navel. The liver was felt bulging downwards nearly as low as the umbilicus, in such a position that its lower edge was nearly parallel to, and a little above, the upper edge of the spleen. The position of the viscera is shown in the accompanying diagram. The urine was free from albumen and from excess of phosphates.

The child was still at the breast. It was ordered to be weaned at once, and had cod-liver oil, with quinine and perchloride of iron.

A considerable quantity of blood was now passed from the bowels with diarrhœa, an occurrence which was immediately followed by a marked diminution in the bulk of the liver. The child did not at first improve, but became more anæmic and waxy in aspect. It had frequent diarrhœa, and further suffered from an attack of bronchial catarrh. It was found, however, that cod-liver oil, in an emulsion with lime water, was retained, and by the help of wine and raw meat he began to amend.

When seven months had elapsed there was a marked improvement in every respect. The child was plump, much

FIG. 5.



A. Liver. *B.* Spleen.

heavier, and had a more healthy tint of skin. The bowels were regular; the appetite good; and the child could now use its limbs freely, though still unable to stand. The spleen and liver had much diminished in size, the spleen measuring only two and three-quarter inches from above downwards, the liver projecting only two inches below the thorax.

The cod-liver oil was now taken, unmixed, without trouble, and the improvement continued steadily. After about ten months the child had lost nearly all trace of the visceral enlargement, and was proportionately improved in other respects.

The spleen was entirely out of reach. The most careful examination failed to detect any sign of enlargement in this organ. The liver had diminished in bulk, insomuch that it could be felt only for an inch below the edge of the thorax, and this only with some difficulty. The general health of

the child had improved in like measure. The appetite was good. He was now rosy in complexion, and had the tint and plumpness of perfect health. He could stand alone and walk for a few steps.

There still remained some evidence of rickets, as evinced by the backwardness in walking, and by want of closure of the anterior fontanelle. In other respects the child seemed in perfect health.

That recovery may occur when the visceral enlargement is extreme, and the circumstances of the case are apparently desperate, the following statement will show.

Case 4.—In the early part of 1861, a child, eighteen months old, named Frances Lewis, the sixth of an otherwise healthy family, was brought to me at the Children's Hospital. She had been falling off in health and flesh ever since she was a month old, and had never walked. She was weaned at nine months. When seen she was in a state of helpless prostration and looked as if she could not live many days. She was extremely emaciated, weighing only fourteen pounds. She was perfectly pallid, and had in a marked degree the waxy complexion characteristic of leucocythæmia. The joints, which were of rickety conformation, were remarkably flexible, so that the limbs could be moved in any direction almost regardless of their ligamentous attachments.

The belly was prominent; the abdominal muscles were loose and thin, allowing the outline of an enormous spleen to be traced with facility. The tumour which represented this organ was dull on percussion and lay close under the abdominal muscles. It occupied the whole of the left side of the abdomen, from beneath the ribs to within from half an inch to an inch of the fold of the groin. Near the hip the tumour approached the groin more closely than towards the median line. The position of the lower edge of the spleen was marked on the skin with nitrate of silver, so that any variations which might occur in the bulk of the organ might be ascertained.

Cod-liver oil, iron, quinine, and nourishing food were

ordered, while the ointment of iodide of potassium was rubbed daily over the enlargement.

At the end of a month she had improved in appearance, gained a pound and a half in weight, and the edge of the spleen had moved up about an inch. The same process of amelioration continued, the gradual diminution of the spleen being shown by the elevation of its lower edge, until at the end of six months this organ was almost out of reach of the fingers, being felt with some difficulty close under the ribs. The child now looked plump and well; it could stand alone, and bore but little resemblance to its former self. She was seen from time to time until nearly three years old, the same treatment being continued. She became fat and rosy. The spleen shrank to nearly its normal dimensions, so that it could hardly be felt in the hypochondrium. She remained backward in walking, but in other respects appeared to be in perfect health.

It will be observed that the treatment adopted in the preceding cases was that ordinarily required in rickets. I formerly thought that outward applications assisted to reduce the bulk of the spleen, but later experience has led me to rely rather upon internal than external remedies. The diet should be nutritious, and carefully adjusted, consisting of milk, beef-tea, meat, and wine, according to the age and condition of the patient, while medicinally cod-liver oil is a prime necessity, and iron and quinine seldom fail to be beneficial. The importance of fresh air is well known in cases of rickets; but this remedy, unfortunately, is not always at the command of the physician.

The preceding details lead to the following conclusions:—

The state of the viscera which has been described as rickety, belongs especially to childhood, and is generally associated with the external signs of rickets. It takes place simultaneously in several organs, and is analogous to the alteration which, under similar circumstances, occurs in the bones.

The change in the viscera is due, not to the presence of any formation foreign to their structure, but to an irregularity of growth, which alters the natural proportions of their tissues. The epithelial and corpuscular element is generally increased, while in the liver the capsule of Glisson, and in the spleen the trabecular tissue is abnormally developed.

The more observable functions of the several organs are but little affected, neither jaundice, ascites, nor albuminuria resulting.

Under favorable circumstances the viscera recover their natural condition, the disease yielding, sometimes readily, to treatment.

The disease which has been described is distinct from the lardaceous or amyloid change on the one hand, and on the other, from that enlargement of the spleen and absorbent glands, which has been associated with the name of Dr. Hodgkin.

Rickety differ from lardaceous organs in the absence of the peculiar bacony translucency, in the absence of iodine reaction, and in the exemption of their blood-vessels from evident alteration.

In the lardaceous there is a deficiency of the alkaline constituents, in the rickety, probably, of the earthy.

The lardaceous change depends usually upon chronic suppuration or exhausting disease, the rickety has no such antecedents. The lardaceous change is rare in early childhood, to which period the rickety disorder especially belongs.

The lardaceous disease, unlike the rickety, generally gives rise to albuminuria, dropsy, and other derangements of function, and in its relation to treatment is eminently intractable.

The enlargement of the absorbent glands and spleen, to which Dr. Hodgkin drew attention,[1] is separated from the rickety change by important differences.

[1] 'Medico-Chirurgical Transactions,' 1832. See also a paper by Dr. Wilks in the 'Guy's Hospital Reports' for 1865.

In the disease described by Hodgkin the glands, swollen by a new growth of fibro-nucleated tissue as well as by an increase in their secreting or corpuscular element, sometimes cause conspicuous lobulated tumours on the surface of the body, a degree of enlargement, which, as far as I am aware, is never attained as the result simply of rickets.

A more important difference is the production, in Hodgkin's disease, of a fibro-nucleated or cellular deposit, distinct from the tissue in which it lies, resembling, to the naked eye, lumps of suet, tallow, or crude tubercle, occurring chiefly in the spleen, but also the liver, kidneys, lungs, and absorbent glands.

Hodgkin's disease is attended with grave symptoms of anæmia, prostration, and anasarca, and appears to have little tendency to recovery.

DESCRIPTION OF PLATE IV.

FIG. 1.—A section of a rickety liver magnified 20 diameters, showing the increase of fibroid tissue in the portal canals, lying somewhat irregularly between the lobules.

The specimen was obtained from the liver of a boy two years old, who died under my care at the Children's Hospital of pneumonia. He was the subject of extreme rickets. The liver weighed 14½ ounces, the body 15 lbs. The liver was firm and elastic, having the characters described in the paper. The excess of interlobular fibroid tissue was evident to the naked eye. The bones, the spleen, and the kidney were all characteristically affected.

FIG. 2.—The section of a healthy liver obtained from the body of a child free from rickets. The portal fibrous tissue is seen in normal amount.

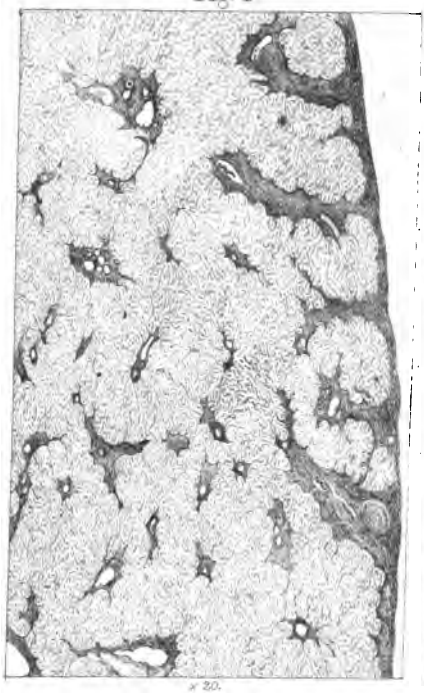
The section is subjoined for comparison with Fig. 1; it was prepared in the same manner, and is magnified to the same extent.

FIG. 3.—The section of a rickety spleen magnified 400 times, showing the irregular swelling of the reticulum described in the paper.

The specimen was obtained from the body of W. Wood (see p. 366.

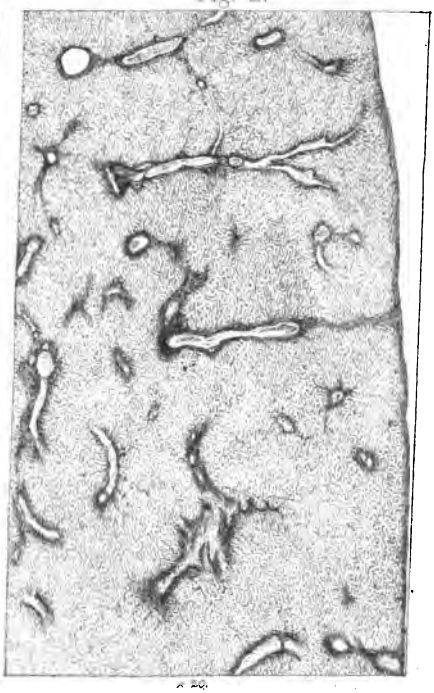
FIG. 4.—A section of a healthy spleen obtained from the body of a child free from rickets. This is given for comparison with Fig. 3. It was made in the same way, and is magnified to the same extent. The reticulum here has its natural appearance of a regular network, with slender threads and comparatively large interspaces.

Fig. 1



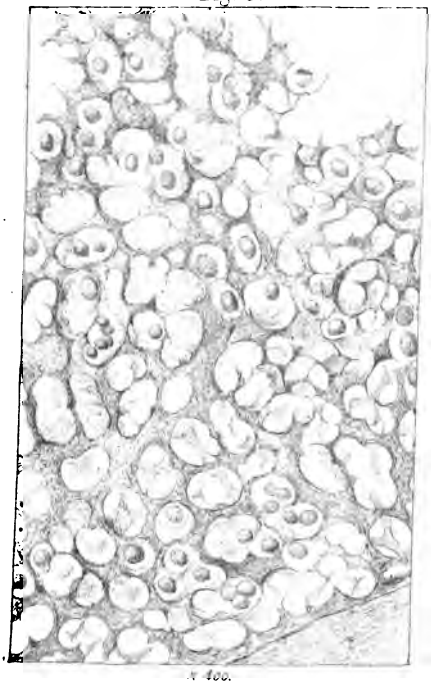
x 20.

Fig. 2.



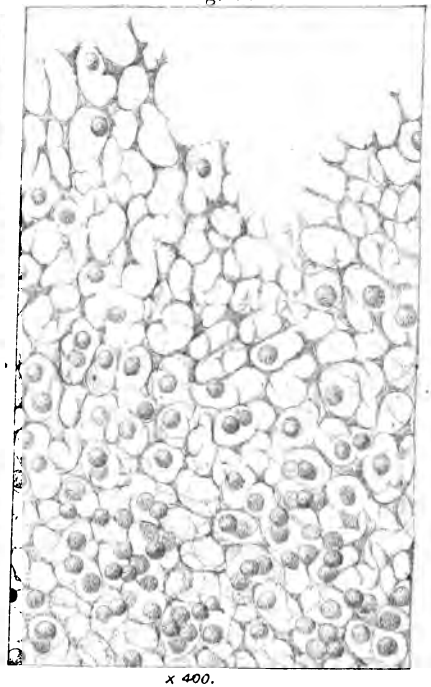
x 20.

Fig. 3.



x 400.

Fig. 4.



x 400.

Tuffen West, ad nat. del. et sc. W. West, imp.

A SECOND COMMUNICATION

ON THE

ENDEMIC HÆMATURIA OF THE CAPE OF GOOD HOPE AND NATAL.

BY

JOHN HARLEY, M.D. Lond., F.R.C.P., &c.

Received June 8th.—Read June 22nd, 1869.

In the 47th volume of the 'Medico-Chirurgical Transactions,' I called attention to the existence of an endemic form of hæmaturia in certain parts of the Cape of Good Hope and Natal; proved that the disease was due to a species of Bilharzia; and attributed the well-known hæmaturia of Mauritius to the same cause.

More than five years have elapsed since these observations were made known, and yet, so far as I am aware, no other observer has repeated them; I therefore feel it necessary that I should lay before the Society, and through it, the profession generally, such further information as I have been able to obtain since the date of my former communication.

Since returning to Port Elizabeth, my friend Mr. Dunsterville, F.R.C.S., has furnished me with the following illustrations of the disease.

1. Two small renal calculi from a young man aged nineteen. "He has had the characteristic hæmaturia for years, and of late has suffered much from occasional paroxysms of pain due to the passage of renal concretions."

The progress of the disease and its attendant symptoms in this patient are identical with those of the case next referred to.

"2. Mr. G. D—,[1] still (June, 1866) continues to pass renal calculi occasionally, accompanied as usual by severe lumbar pain and suffering. I send, enclosed, the last voided—a very small one."

I crushed up this minute crystalline body after it had lain in a dry state for three years, and after treating it successively with solution of potash and nitric acid discovered by the aid of a half inch object-glass one entire egg of Bilharzia, and several unmistakable fragments of others.

3. At the same date (June, 1866) Mr. Dunsterville states: "I really think we have not nearly so much of the hæmaturia as formerly. I have not seen a case for a very long period, and certainly none has offered which gave me a chance of sending you any of the deposits or post-mortem scrapings of mucous membrane which you so much desired."

4. Two years previously Mr. Dunsterville sent me by his friend and colleague Dr. Rubidge two samples of urine secreted respectively by two brothers, William and Philip Jones. They had the usual symptoms of the disease. The urine of the first-named patient was mouldy, strongly ammoniacal, and had deposited much phosphate. It nevertheless contained numerous well-preserved eggs of Bilharzia. The secretion from the other patient was fœtid and had deposited much uric acid. It also contained well-preserved eggs of the parasite, and in the few drops examined there were four adult cheese mites (*Acarus domesticus*), and two advanced eggs of the acarian, distinguished from those of Bilharzia by their uniformly rounded extremities. I mention this fact because, having only twice before observed acarus in the urine, it chanced each time to be that of a patient suffering from the endemic hæmaturia.

Dr. Rubidge, of Port Elizabeth, wrote me the following in 1866:

[1] 'Medico-Chir. Trans.,' vol. xlvii, p. 65.

"In compliance with your request that I would furnish you with all the information I can obtain on the subject of the endemic hæmaturia of this and the neighbouring town of Uitenhage, I send you the following notes: It is almost strictly confined to these places and to Fort Beaufort."[1]

"It occurs in young Europeans or persons of European descent. The natives,[2] as far as I have inquired, are not subject to it, nor I think the Malays or negroes imported in former times as slaves."

"Pretty extensive inquiries lead me to believe that bathing in rivers has something to do with the production of the disease. I have never met with a case in boys who did not frequently bathe in the Zwarlkojss or Booker's river. On the other hand, those few boys in the families of my patients who are free from the disease, bathe in the sea only. My impression is that the parasite gains entrance into the skin while the individual is bathing in the river, and I may mention that the lad W. Jones, whose urine I took home to you (see above, 4), described a sort of urticarious eruption attended with great irritation, as a frequent result of bathing in the Booker's River.[3]

"The hæmaturia never, I believe, occurs in children under five or six years of age. Females are rarely affected, if at all. I have not myself observed a single well-marked case in this sex."

In a letter to my friend Mr. Henry Lee, Dr. S. Spranger, referring to my observations on the hæmaturia of the Cape, relates two cases. The one is too doubtful, I think, to advance as an instance of the disease; the other is as follows:

"Mr. S—, of Alice, consulted me about two years ago,

[1] Mr. George Saunders has not observed it here. See 'Med.-Chir. Trans.,' vol. xlvii, p. 70.

[2] On this point see corroborative statement further on—p. 386.

[3] I carefully examined a number of fresh-water mussels (*Unio Kaffre*) from this river, and sent to me by my friend Mr. Dunsterville. I failed to detect any trace of Bilharzia, but the paleal membrane of every individual was thickened and speckled by vast numbers of the acarian *Hypopus* in every stage of development.

suffering from hæmaturia. The symptoms were those described by Dr. Harley, only of a very aggravated nature. They were of long standing. The patient was a Scotchman, aged seventy-six, and had been hale and hearty. He was more or less under my care for three months. He died worn out by the various concomitants of his disorder. As I was in a distant part of the colony at the time of his death, no post-mortem was made. I would remark that these cases are not confined to Uitenhage and Port Elizabeth, I have found them in Alice[1] and in British Kaffraria. *Army surgeons do not commonly see many of those living on the soil*, and their troops do not remain long enough to contract the disease.[2] The water over almost the whole of the eastern part of the colony is *brackish*, but the disorder is more probably contracted from Vleys or ponds by the wayside, than from the running streams."

Thus much for the disease in the Cape Colony, I now turn to Natal.

In my former communication, I concluded from the statements of Dr. W. Johnstone, and Mr. Joseph Henderson ('Medico-Chirurgical Transactions,' vol. xlvii, pp. 67 and 70), that the parasitic disease was prevalent in Natal. I am now enabled to advance proofs of the truth of this conclusion.

Case of endemic hæmaturia in a colonist of Natal.—The patient arrived in England in the spring of the present year and continues at the present time under my care. The following is his history. He is a healthy and remarkably active man, aged thirty-seven, is married and has a healthy young family. He has resided near Verulam, on the banks of the Umhlazren, a tributary of the Umhloti, since the year 1860, and first noticed hæmaturia January 1868. The symptoms are the passage of small shreddy flakes or strings, either opaque and colourless, or like minute clots of blood, and occasionally at the end of micturition a

[1] Contradictory evidence, see 'Med.-Chir. Trans.,' vol. xlvii, p. 70.

[2] It appears that a residence of six months is sufficient. See a subsequent page—385.

teaspoonful or two of bloody urine. There is a slight tickling sensation at times in the hinder part of the urethra never amounting to pain, but sufficient to cause inconvenience, and, at times, annoyance. Occasionally there is a feeling of slight oppression in the hypogastric region accompanied by lassitude. The general health is very good.

The first specimen of urine (a tablespoonful) which he brought to me was turbid and of a blood colour. It deposited a layer of blood-stained organic matter in which were entangled many of the characteristic ova of Bilharzia Capensis. The next sample was of natural colour, deposited a flocculent, specky mucus, together with one or two larger and more consistent flakes of mucus, of a dirty white colour or more or less completely stained with blood. The largest did not much exceed a hemp seed in bulk, and contained imbedded within it between two and three hundred eggs of the parasite.

I have examined the urine voided daily for months, and on each occasion found numbers of the ova floating freely in the urine, and also, when it is present, imbedded in a dense opaque mucus, which seems to be their appropriate nidus. The fertility of the parasite is wonderful. When I first saw my patient he was voiding hundreds of eggs daily, and sometimes they could be numbered by thousands.

The urine itself is normal in quantity, and—apart from the products of the parasite, and occasionally a little blood and albumen—in composition also. There is no tendency to ordinary cystitis or to ammoniacal alkalinity of the urine. Indeed it is constantly acid and frequently deposits lithic acid on standing. The sp. gr. ranges from 1015 to 1025, the colour is rather pale. The albumen of course varies with the quantity of blood contained in the secretion. At most it does not exceed in bulk one fifth that of the urine, and when the secretion is as colourless as whey, only a very faint opalescence is produced by the means requisite for the precipitation of the albumen.

As to the parasite itself, I have nothing to add. The

figures which accompany my first papers furnish a complete delineation of the parasitic products in the present case. The mucus in which the eggs are for the most part imbedded, is derived, I believe, from the mucous crypts in which the animal takes up its abode, the growth of the mucous corpuscles being due to the irritation caused by the body of the parasite and its eggs, just as occurs in the vegetable kingdom in the development of a ball or gall on the oak around the ova of *cynips*. As soon as the solid mucus fills the crypt it is forced out by the continued production of eggs, and, being thus roughly moulded, appears in the urine in the form of little pellets or strings. Some softer or more fluid masses become disintegrated and form the usual flocculent mucous deposit.

Treatment.—The parasites being thus safely lodged in the mucous crypts, the mouths of which are closed by their deposits, it would be of course useless to attempt an attack on the parasite by local means. Even if the body of the parasite lay bare upon the surface of the mucous membrane the injection of styptics into the bladder would probably do more injury to the host than to the parasite. In my opinion, topical treatment is therefore out of the question, and we are reduced to the use of such general remedies as passing unaltered through the kidneys may exercise an injurious effect on the parasite. I have shown that the active principles of belladonna and hyoscyamus are wholly removed in an unchanged condition in the urine;[1] and I am hopeful that these substances thus brought in contact with the parasite may at least restrict its development, and by constantly dwarfing its growth, ultimately destroy it. Guided by these considerations I prescribed the following for my patient: ℞ Extracti hyoscyami gr. v, Oxydi argenti gr. ¼; fiat pilula, omni nocte sumenda. And with the view of annoying the parasite as thoroughly as possible I gave a morning dose composed of the following: ℞ Olei Cubebæ ♏x—♏xv, Spiritus vini rectificati ʒij, Infusi Absinthii ad ℥iss; fiat haustus.

[1] 'The Old Vegetable Neurotics,' pp. 213—336.

Up to the present time I have reason to be satisfied with this treatment. Since it was commenced a little free blood has been only twice voided; the albumen has disappeared; free mucus, which previously formed a large dense cloud, is now rarely present, and the oviparous function of the parasite is decidedly less active.

Further information respecting the prevalence of the disease in Natal.—My patient tells me that he is acquainted with five male adult Europeans resident in his district who are affected by the disease. Their symptoms correspond exactly with his own, but some have lumbar and hypogastric pain superadded. The parasite appears to be limited, as in the Cape, to certain localities near the coast. Of the two known habitats one is the Sterk Spruit, a tributary of the Umlazi, situated about seventeen miles from the sea, in County Durban;[1] and the other in Victoria, the Umhlazren, a tributary of the Umhloti, distant about five miles from the coast. These two stations are about twenty-five miles apart. How far the contamination of the two principal rivers above mentioned extends inland remains to be determined. It appears that the elevated regions of the interior[2] are free from the parasite.

One fine young man, aged twenty-eight, is a great sufferer. He had resided the greater part of his life up the country, and had only recently come down to the coast, and since that time he has contracted the disease.

My patient employs a large number of men, chiefly coolies imported from Madras and Bombay, and some Kaffirs. The coolies become affected with hæmaturia after a residence of five or six months in the colony. They complain at intervals of lassitude and inability to work, and it is not an uncommon event for three or four of the men together to prefer their complaints to my truly sympathising patient,

[1] 'Medico-Chirurg. Trans.,' vol. xlvii, p. 70.

[2] Pietermaritzburgh and Greytown, situated about fifty miles from the coast, have the altitudes of 2000 feet and 3580 feet respectively.

bearing on castor-oil leaves the little bloody strings voided in the urine, as evidence of their malady.

This gentleman further states that the Kaffirs are wholly free from the disease, and this corroborates the previously expressed opinions of my friends Dr. Dunsterville and Dr. Rubidge. The last-named gentleman assigns bathing as the means of receiving the parasite, and my present patient tells me that he bathes every evening in the waters of the Umhlazren, which flow through his private bathing house. The workmen also bathe frequently in this river.

It is certainly more reasonable to suppose that the parasite gains access to the bladder and kidney by the urethra than to assume that it reaches the urinary organs—and these only, as appears to be the case at first—through the general circulation. But in seeking to know the mode of invasion we must be prepared to turn our investigations readily in any direction. The Kaffirs, it appears, are free from the Bilharzia, while they are infested with tape-worm; the colonists and coolies, on the contrary, are very liable to the invasion of Bilharzia. With regard to the habits of these two races, Mr. Le Mesurier communicates the following, which is inconsistent with the notion that the parasite gains access to the body during the process of bathing. "The Kaffirs are very attentive to personal cleanliness; they bathe and wash every day, and in the hot weather three or four times a day. The coolies, as a rule, are not cleanly in their persons, and they bathe much less frequently."

On mentioning salads to my patient, as a possible means of taking the parasite, he said, "I do eat salads, and all green food very freely, and your question reminds me of a curious and perhaps important fact. On the estate adjoining ours there is an abundant supply of water-cress, and one of the two Europeans living on the estate has been troubled for a long time with the hæmaturia. They both make water-cress a standing dish at their table; I obtained some plants from them and formed a bed, and it was after occasionally eating the cress for breakfast that I discovered I was affected with the disease."

One question I hope to be able to determine before long, viz. whether the parasite is able to attain mature development in the animal body, the egg being the starting-point.

It is to be hoped that those of our medical brethren who have the means of tracing the development of the parasite in its native habitat will lose no opportunity of doing so. The disease is altogether preventible, and he who may be fortunate in discovering how and where precisely the enemy is to be avoided will merit the gratitude of his countrymen.

Postscript.—At page 380 I have called attention to the occasional presence of *Acari* in the urine. It is remarkable that I have repeatedly observed the same fact with regard to the secretion of my Natal patient.

COMPLETION OF THE CASE

OF

CONGENITAL HYDRONEPHROSIS

REPORTED IN THE FORTY-EIGHTH VOLUME OF THE 'TRANSACTIONS' OF THE SOCIETY.

BY THE LATE

THOMAS HILLIER, M.D., F.R.C.P. Lond.,

PHYSICIAN TO THE HOSPITAL FOR SICK CHILDREN AND TO THE SKIN DEPARTMENT IN UNIVERSITY COLLEGE HOSPITAL.

Received Oct. 7th, 1868.—Read June 22nd, 1869.

The history of the case was brought up to December, 1865, in the paper referred to.

From that time until July, 1868, he was occasionally seen by me, and I had reports of his condition from his father. Once in that period he was tapped and a quantity of urine-like fluid was drawn off. He continued in a weak state of health, very thin, small of his age, and with great distension of the abdomen, which prevented his moving about. His urine was usually clear, free from albumen, and in moderate quantity.

On the 16th July he was again admitted into the Hospital for Sick Children, in consequence of his complaining a good deal of headache and feverishness. He was able at

this time to sit up and talk with moderate vivacity. There was no marked dyspnœa.

On the 20th he vomited and became drowsy and listless; his face became flushed, and he refused all solid food. His temperature in the axilla was 103° Fahr.

23rd.—Still almost unconscious. Pulse 144, weak; respiration 56, temperature 101·2°. Some moist sounds over the base of right lung. Passes urine involuntarily.

25th.—Some return of consciousness. Occasional twitching of hands. Dulness of percussion noted over base of right lung, with moist sounds over both bases. Pulse 84, very irregular. Temperature 101°. Sordes of mouth and teeth. Takes food a little better.

27th.—Still drowsy, but looks better. Pulse 144, respiration 70. He spoke this morning. Alæ nasi dilate with inspiration.

28th.—Pupils large, very sluggish, left more dilated than right. Bowels confined, motions passed in bed without notice. Pulse 124, not quite regular. Respiration 40.

29th.—Lies on his back, never speaks; sleeps nearly all day. Has not passed water for twenty-four hours.

30th.—Passed plenty of water last night, which was free from albumen, contained uric acid and epithelial scales of squamous variety. Temperature 101°. Too ill for chest to be examined.

August 1st.—Pulse 162; respiration 36.

3rd.—Gradually sinking; can scarcely swallow.

On the 5th he died.

Post-mortem examination, twenty hours after death. *Weight* twenty-seven pounds. Much emaciated; arms and legs somewhat deformed from rickets.

Abdomen.—Circumference twenty-four inches. On opening the abdominal walls a large cyst was found filling the greater part of the cavity, free from adhesions anteriorly. The small intestine lay over the upper part of the cyst; some of the mesentery was adherent to the upper part, and some to the lower, as if the large mass had come forwards between the mesenteric folds. The duodenum was

adherent to the upper and left side of the cyst. The peritoneum in the right lumbar region was reflected in a vertical line with the anterior spine of the ilium. The left kidney, seen *in sitû*, did not appear much enlarged. On tearing away the cyst from its attachments in the right loin, its posterior portion was found to occupy the situation of the right kidney, and the supra-renal body, of normal size and appearance, was found attached to it. In the right loin the cyst presented a constriction, behind which a portion of the cyst presented somewhat the appearance of a greatly enlarged kidney; the colour, however, was pale and bladder-like. One very small part of the cyst-wall near what would be the hilus of this reniform part of the cyst showed a very pale kidney colour. The main body of the cyst in front of this was globular or rather ovoid. The ureter was found proceeding from the lower part of the cyst, attached for about an inch to its wall. This ureter, examined from the vesical extremity, was found to enter by a much smaller orifice than usual. A small dressing probe was with difficulty passed up the ureter, being very firmly grasped, especially near the bladder. When the probe had been passed to within two inches of the cyst and withdrawn, fluid could be squeezed out of the cyst through the ureter into the bladder by drops. Previously to the passage of the probe none of the contents of the cyst escaped on pressure. The ureter externally presented nothing abnormal in its appearance, but was smaller than normal.

The *left ureter* was distended at its upper two thirds to about an inch in diameter. At its lower end it was of natural size and contained calculous matter, which formed an obstruction to the flow of fluid, which could, however, be without difficulty overcome. The pelvis of this kidney was dilated snfficiently to contain a small pigeon's egg, and contained a little calculous matter. On examination the gravel was found to consist of uric acid.

The cyst measured twenty-seven inches in circumference over the long diameter, and twenty-four inches over the short one. It was nine inches long by eight wide, and six

and a half inches deep. It contained eighty-three ounces of clear fluid, having a pale lemon colour and urinous smell. Sp. gr. 1002, very slightly acid, with the faintest trace of albumen, and presenting under the microscope a few broken-down cells of large size. The mesenteric glands were enlarged and hard. Intestines healthy.

Liver weighed sixteen ounces, healthy, except that on its upper and under surface were a few small tubercles. There were also a few on the peritoneal aspect of the diaphragm.

Spleen weighed one ounce six drachms, and contained tubercles on the surface and a few in its substance.

Heart weighed two and three quarter ounces, healthy.

Lungs contained miliary tubercles scattered throughout their substance. The lower lobe of the right lung was collapsed.

Brain.—On the upper surface of right hemisphere, extending also between the falx and the hemisphere, binding them together, was a little lymph of recent date. The convolutions were flattened and had a fluctuating feel near the anterior part of cerebrum. The anterior lobes were rather softer than normal, but not redder; both lateral ventricles were filled with a large amount of clear fluid. All the central parts of the brain were softened, the right anterior lobes near the corpus striatum were almost creamy. In the centre of the left corpus striatum was a small body about the size of a pea; the nerve substance around was soft, but not red. It was firm and contained a creamy matter. Under the microscope the creamy matter looked like degenerated nerve-cells; there were no pus-globules visible. At the base of the brain there was lymph near the olfactory nerves, around the optic commissures and to a less degree around the pons and the nerves arising from this part. There were granules of tubercle in Sylvius's fissures.

Remarks.—The post-mortem examination quite confirmed the diagnosis which was made during life. As was supposed, the great distension of the abdomen was due to an obstruction in the right ureter, causing an enormous accumulation of urine in the pelvis of the kidney. The exact

nature of the obstruction could not be ascertained during life. It was either congenital or occurred almost immediately after birth. It was not of such a character as at all times to prevent the passage of fluid from the kidney to the bladder, because there was distinct evidence that occasionally the obstruction was overcome for a time, when distension had been very great.

The obstruction was found to be due to an abnormally small ureter, a congenital stricture, through which fluid did not usually pass, although it might do so under extreme pressure from dilatation. The pelvis of the left kidney was also somewhat dilated, as was anticipated, though not to so great an extent. The dilatation on this side was due to a formation of calculous matter, which occasionally clogged up the ureter. The patient died from acute tuberculosis.

With the experience derived from this case I cannot see that any fresh indications for treatment in a similar case are to be obtained.

The extirpation of the right kidney was discussed; but it was considered to be an unjustifiable proceeding, especially in a patient of such a feeble constitution as this boy.

The fatal results which have attended extirpation of the kidney in animals tend to discourage any attempts to adopt this operation in the human subject.

Tapping was attended with temporary relief, but fluid rapidly reaccumulated, and after a short time irritative fever was set up, and the fluid became purulent and albuminous. During the later period of his life the operation was not repeated, for although the distension was very great it seemed not to increase beyond a certain point. There was probably a small escape of fluid through the constricted ureter constantly going on.

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